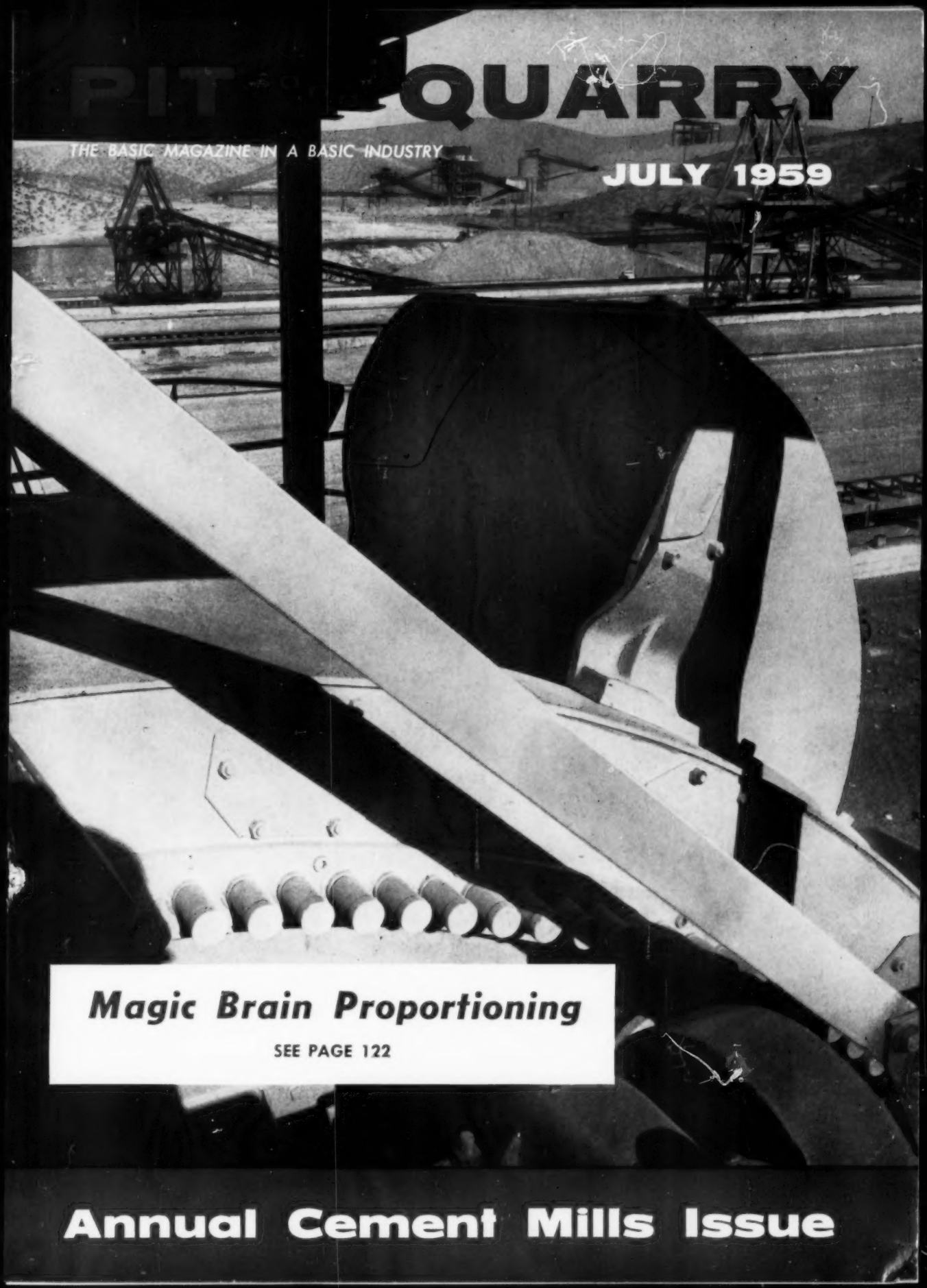
PIT & QUARRY
THE BASIC MAGAZINE IN A BASIC INDUSTRY
JULY 1959
Magic Brain Proportioning
SEE PAGE 122
Annual Cement Mills Issue

3 I-R Drillmasters REPLACE 17 OTHER DRILLS in large quarry operation

In a four-million-ton per year quarry, operated by Solvay Process Division, Allied Chemical Corporation, three Ingersoll-Rand Drillmasters are now doing the same amount of work that previously required eleven churn drills and six wagon drills!

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For maximum production at lowest overall cost, join the swing to the Drillmaster method. Your Ingersoll-Rand representative will be glad to tell you all about it. Call him today.

Ingersoll-Rand

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A CONSTANT STANDARD OF QUALITY IN EVERYTHING YOU NEED FOR ROCK DRILLING

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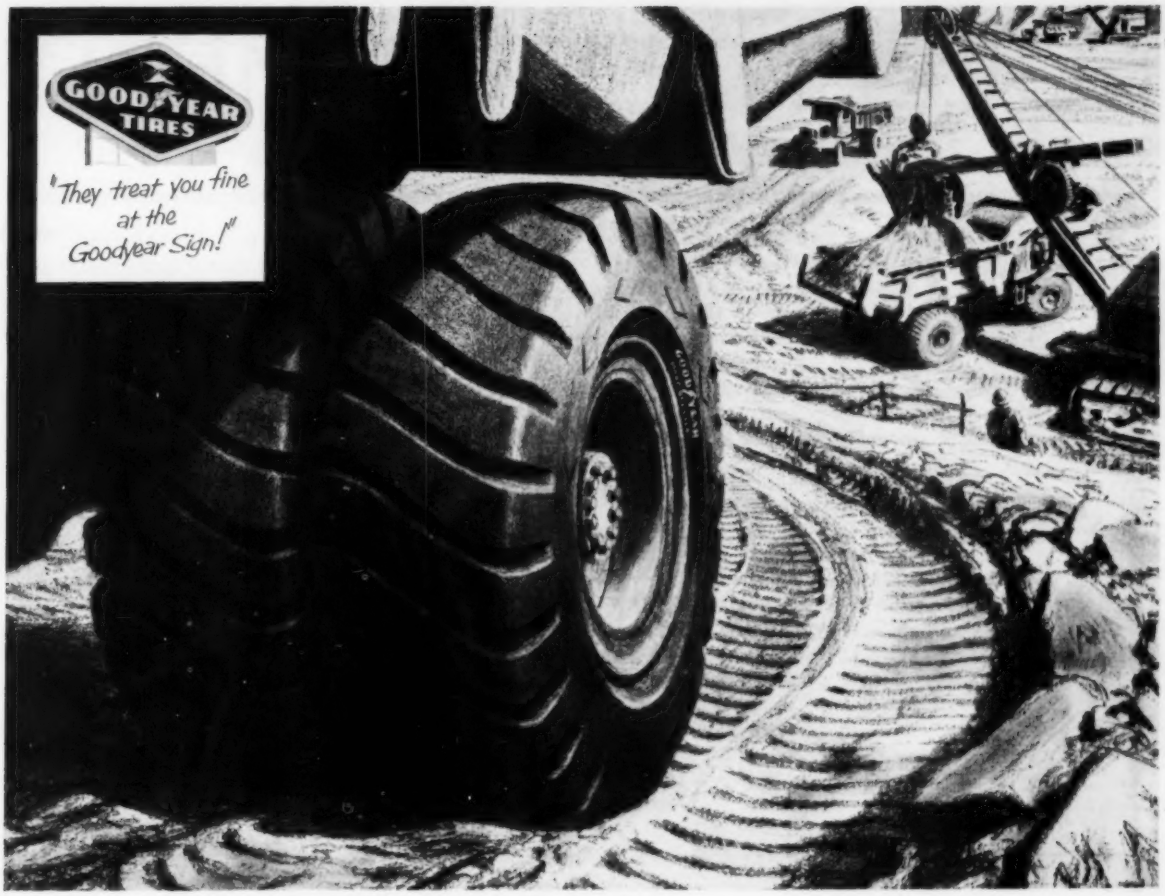
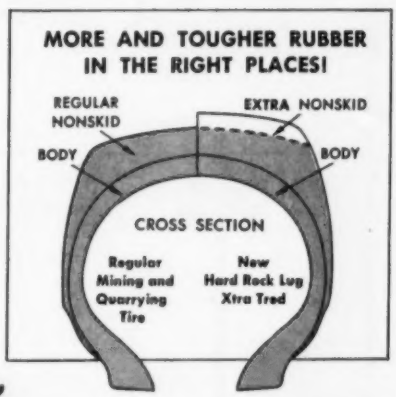


EXTRA TREAD TO TAKE IT WHERE THE GOING'S EXTRA TOUGH!

NEW HARD ROCK LUG XTRA TRED

Specially Engineered Tire for Mine and Quarry Work

More and tougher rubber in the right places—exclusive Triple-Tough 3-T Nylon Cord to back it up. That in a word is why this great new Goodyear tire tops its class. Specifically designed to take the hard knocks, the Hard Rock Lug Xtra Tred—with 18% more tread rubber, reinforced lugs, bonus shoulder heft and huskier sidewalls—stands up under tough punishment that kills lesser tires in short order. And thanks to 3-T Nylon Cord, greatest tire saver in 24 years, cuts, bruise-breaks and blowouts are reduced to an all-time low. Get full details from your Goodyear dealer now. Goodyear, Truck Tire Dept., Akron 16, Ohio.



GOODYEAR

Xtra Tred—T. M. The Goodyear Tire & Rubber Company, Akron, Ohio

MORE TONS ARE HAULED ON GOODYEAR TRUCK TIRES THAN ON ANY OTHER KIND

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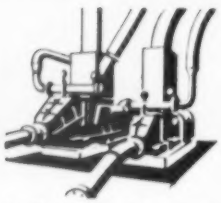
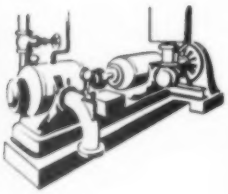
FULLER EQUIPMENT

for the process industries

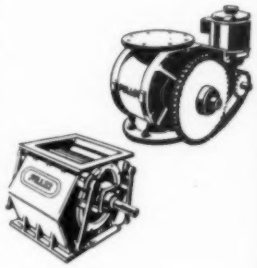


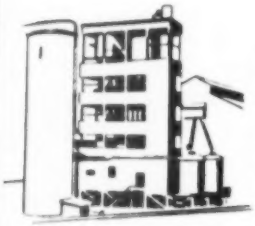
Pneumatic Materials Handling Systems. Widely specified throughout the process industries, Fuller's range of equipment offers best single source for solving problems in moving dry bulk materials pneumatically. Fuller-Kinyon Pumping Systems, Airveyor® Pressure and Vacuum Conveying Systems, and F-H Airslide® Fluidizing Conveyors are completely sealed to prevent both contamination of the product and any leakage of dust, etc., into the surrounding area. They are used to move dry, granular and pulverized materials to and from cars, ships, trailers, storage and processing points.



Fuller Rotary Compressors and Vacuum Pumps are vibration-free, can be installed anywhere, even on balconies. Fewer moving parts mean minimum maintenance. Compressors and Vacuum Pumps handle air and gases from 30 to 3300 cfm at pressures to 125 lb. gage. Vacuums to 29.95 in. (referred to 30-in. barometer).

Fuller Vane-type and Roll Feeders . . . for volumetrically controlled feeding of a wide range of dry pulverized or granular materials. Also Fuller Rotary Valves . . . used under silo deck slabs and bins to permit the free flow of pulverized materials which tend to arch, such as lime and cement raw materials.





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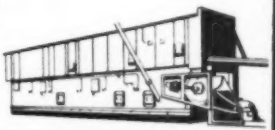

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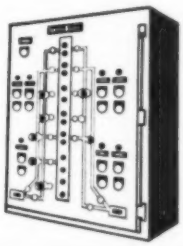
Fuller Control Panels permit automatic, remote, one-man control of multiple operations. Easily-read panel permits visualizing flow of material to storage or from process bins.



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1356
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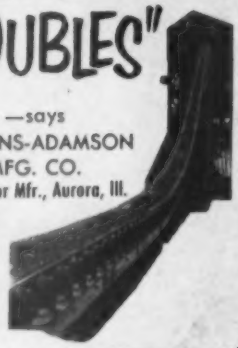
—says
STEPHENS-ADAMSON MFG. CO.
Conveyor Mfr., Aurora, Ill.



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pit and quarry

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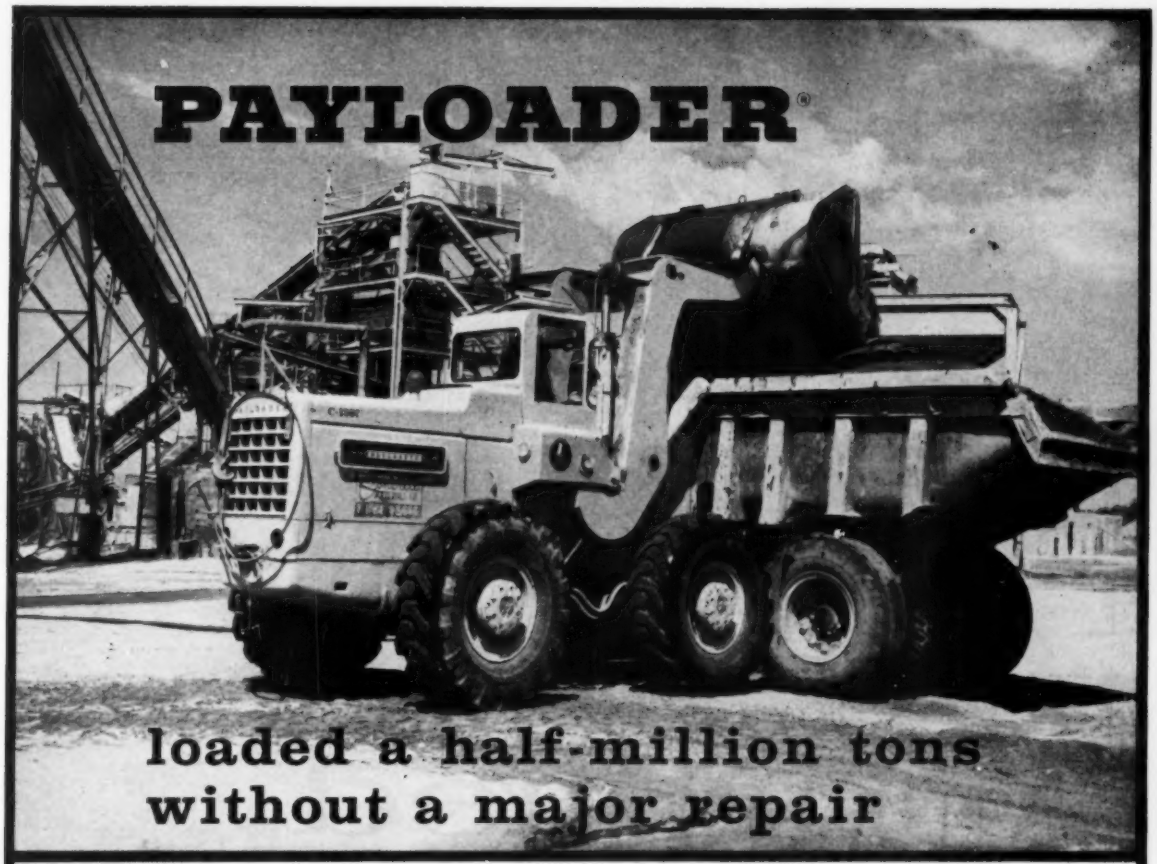

Good Equipment plus Good Maintenance Pays Off

Equipment Superintendent, Ed Becker says, *"We bought our first* 'PAYLOADER' *in 1946 and have been using them ever since because they have done such a fine job for us. For example, one loaded over half a million tons of stone and sand without a repair worth noting. The others have similar records of repairs costing pennies and availability for work near 100%."*

Concrete Materials Co., Sioux Falls, S. D., is a successful and busy materials plant producing crushed stone, gravel, sand, ready-mix and asphalt. Their "PAYLOADER" fleet will consist of six upon delivery of two big new model H-90's, on order. They are kept busy loading trucks, spotting and loading gondola cars, stockpiling, cleaning up and doing many other jobs.

President, R. S. Sweetman, believes in and practices a policy of "good equipment plus good maintenance", and keeps a close watch on the production of all machines. For example, he reports the following production figures for a Model HO "PAYLOADER" with 2¼ yd. bucket handling ¾" quartzite: loading dump truck — 17 tons in 2 min. 50 sec. (360 t.p.h. rate); loading two gondola cars with 40-ft. one-way haul — 116 tons in 27 min. (255 t.p.h. rate).

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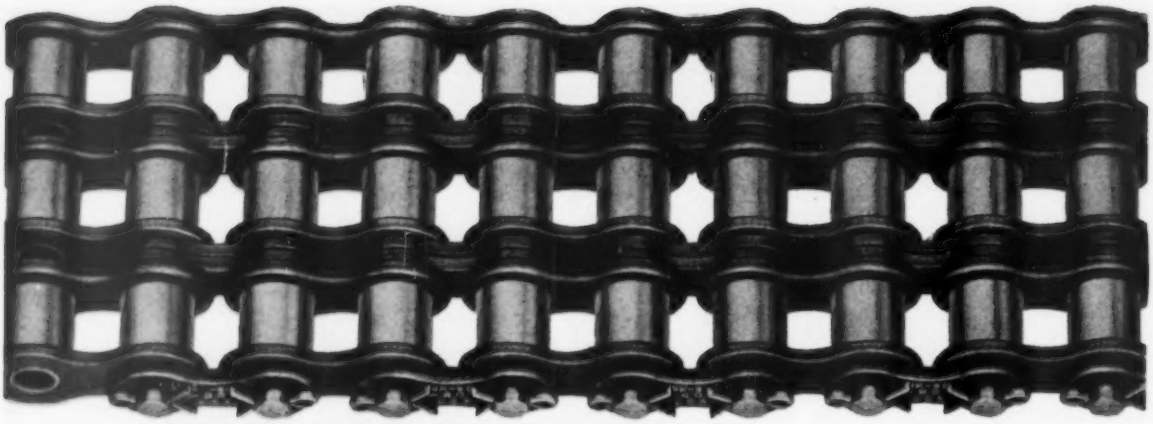

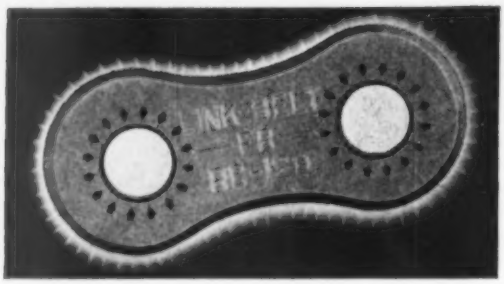

Arrows indicate critical areas treated with compressive stresses to improve fatigue resistance.

Fortified against fatigue

65 TONS OF CYCLIC TENSION! With this equipment—largest of its kind known to be in operation in roller chain testing—Link-Belt tests and rates roller chains. Rapid "stress-on, stress-off" action duplicates operating conditions at a greatly accelerated pace . . . proving over and over that Link-Belt chains are fortified against fatigue.

Link-Belt offers special FR® processed roller chain for applications involving repeated high-tensile loads

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The FR process results from the same design and metallurgical research that has produced many more "extras", all *standard* in Link-Belt roller chains. They include shot-peened rollers, close heat-treat control, lock-type bushings and others. For further details on Link-Belt roller chains, send for Book 2657.

LINK-BELT

15,070

ROLLER CHAINS AND SPROCKETS

BOOK 2657 has 154 pages of roller chain data. For your copy, contact your nearest Link-Belt office or authorized stock-carrying distributor. (See CHAINS in the yellow pages of your phone book.)

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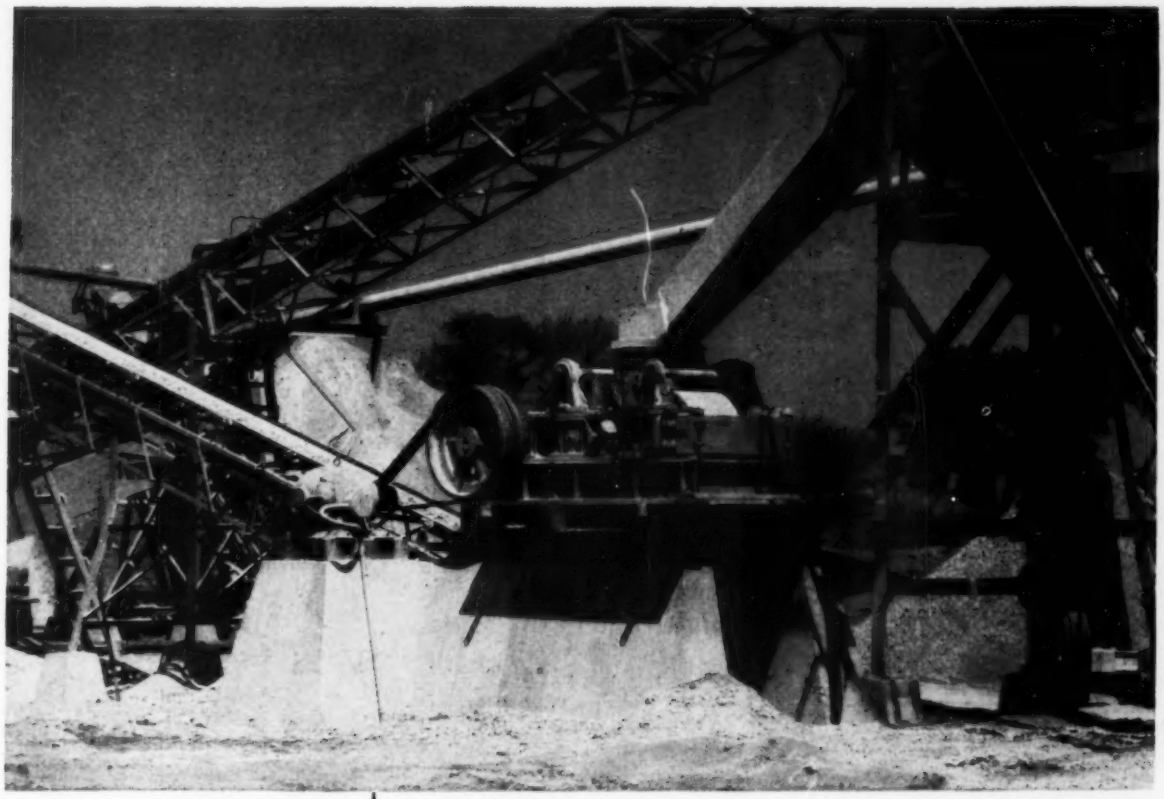

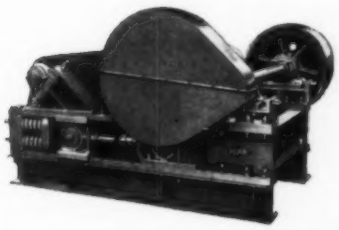

Diamond Roll Crushers are available in roller bearing design, star gear or chain drive, and plain bearing design, chain driven.

Roll Sizes

16x16	30x18	36x22
24x16	30x20	40x22

Ask for illustrated catalog D-5413

Diamond makes everything for the aggregate producer:

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How to produce small aggregate at lowest cost . . .

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Diamond Antifriction Roll Crusher is job proven to be the most effective reduction unit for producing small aggregate. This is particularly true when it is used to reduce oversize aggregate produced by preceding crushers.

Compare the following advantages with other crushing equipment:

- **Greater capacity of material for its weight**
- **Requires less h.p. per ton produced**
- **Freedom from stresses**
- **Simple maintenance, effective lubrication**

All Diamond units have two rolls . . . one is fixed, the other floats. To allow a slight cushion effect, and eliminate wear and tear due to shock, heavy tension springs hold the floating roll and permit quick opening in the event of overloading or in case tramp iron or other foreign materials enter between the rolls. This protects shells and other parts against damage.

Accessible mechanism and ease of adjusting the opening between the roll shells allow the size of the product to be changed at will.

Diamond Roll Crushers earn their keep—contribute to profits, too—in pits, quarries and on construction jobs. Get full details today . . . see your Diamond distributor.

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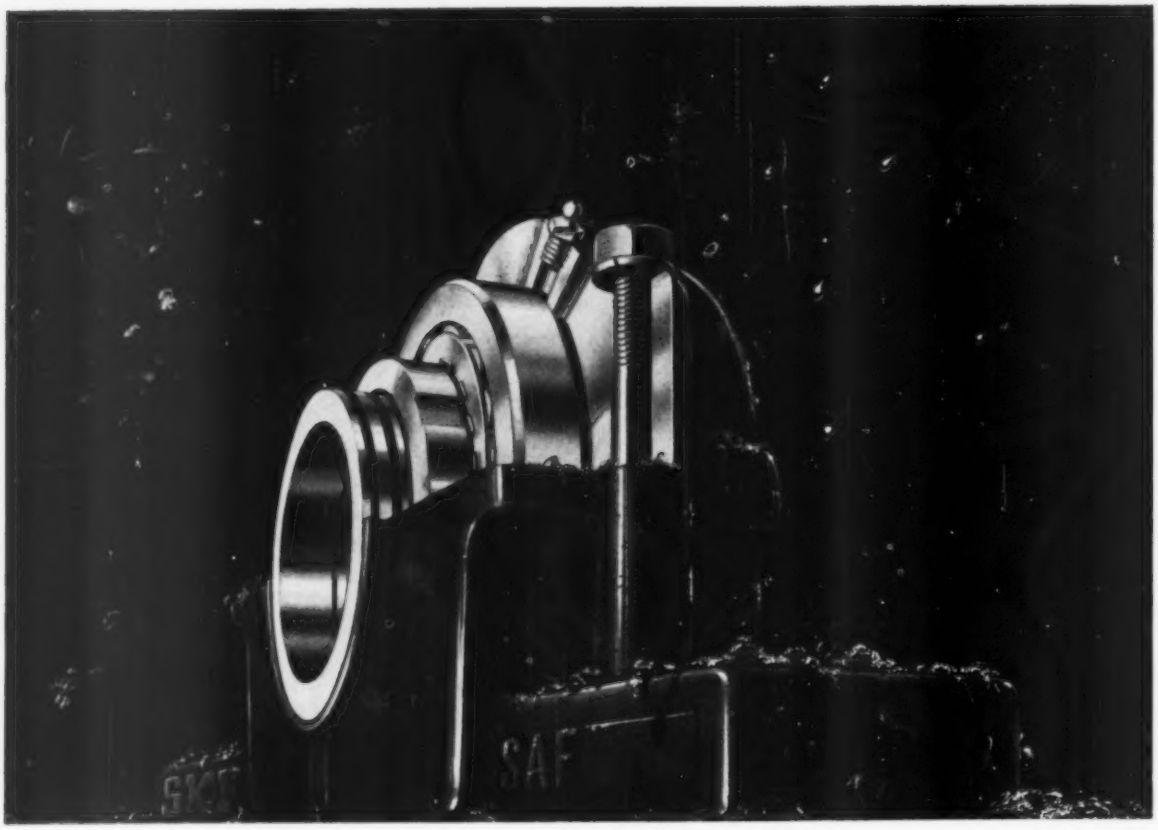

SKF Triple Seal provides best possible protection

The SKF Triple Seal is a heavy duty, general purpose seal designed for use with oil or grease lubrication. It was developed by SKF to protect the bearing from foreign materials while providing an effective barrier against lubricant leakage.

The bearings in all SKF split pillow blocks are protected by triple seal rotating rings. The seals are triple lipped and are one integral unit. They are mounted with a slip fit on the shaft which permits unrestricted axial motion. Being of the labyrinth type, there is no friction between the rotating and stationary components; consequently, there is no wear and no replacement problem.

SKF Triple Seal Type SAF pillow blocks, with ball or roller bearings, give long trouble-free service. If your design involves abnormal operating conditions, cast steel housings (designated SAFS and SDAFS) are available. These heavy-duty pillow blocks are recommended for use in oil field machinery, steel and rubber mills, crushers, etc.

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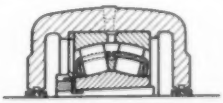
SAF medium-duty pillow blocks contain the new SKF spherical roller bearings which offer 25 to 50% increased capacity, 2 to 3½ times longer life.



SDAF pillow blocks are designed for heavy-duty applications and also contain the new SKF spherical roller bearings.

5917

Spherical, Cylindrical, Ball, and Tyson Tapered Roller Bearings

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SYNTRON

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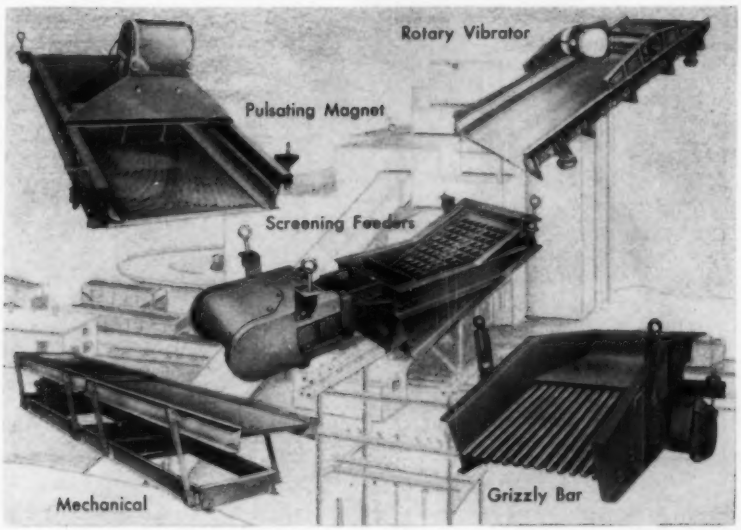

for efficient, dependable, low cost scalping, sizing, dewatering or fine screening

SYNTRON builds a vibrating screen for every screening job from heavy duty scalping of rock to fine quality control screening of aggregates.

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SYNTRON Screens provide uniform vibration, eliminating dead spots. Constant full screen efficiency provides more effective separation and higher capacity.

SYNTRON Screens combine efficiency, dependability and low maintenance to give better separation, greater tonnage at lower cost.

SYNTRON Screens are compact, easy to install, easy to maintain.

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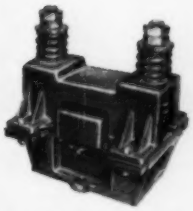

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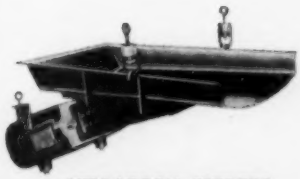

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ROTARY VIBRATOR CAR SHAKERS

VIBRATORY PACKERS & JOLTERS

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NEW TALBERT'S "SKELETON – FRAME"

greater payload capacity for frame dump trailers

Talbert's "Skeleton-Frame" construction provides the stability of frame-type Dump Trailers . . . PLUS . . . the increase of thousands of pounds to your payload! Only Talbert combines the features of frame construction with "frameless" light weight.

CHECK AND SEE . . . you'll agree Talbert gives more!

STABILITY AND SAFETY—All axles are securely on the ground during lift.

PROVEN WEIGHT DISTRIBUTION—Usually not found in frameless trailer designs.

EASIER HANDLING—More reliable in tough unloading areas.

HIGHER STOCK PILING — Reduces rehandling costs and material storage areas.

Don't chance it! Get that extra margin of safety! . . . with increased payload! Talbert's "Skeleton-Frame" Dump Trailer is available in 20 and 26 foot lengths. Get Talbert Trailers for longer service with less maintenance. Your Talbert Distributor will gladly tell you all about it . . . see him today . . . or write for complete information!

Talbert Trailers, Inc.
7975 WEST 47th STREET
LYONS, ILLINOIS

Washington News Letter

By S. HERBERT UNTERBERGER

THE job of being Secretary of the Treasury has never been easy, but just now Secretary Anderson is having a much tougher time than usual.

This year again the Federal Government is running a deficit. To meet this bill, it is necessary that the Secretary borrow money. He is finding it increasingly more difficult to do this, particularly on a long-time basis, because as the law now stands, the top price he can pay for money is 4¼ percent on borrowing that runs more than five years. At this rate investors do not find the prospect of putting their money into long-term government bonds very attractive. As a matter of fact, they can do much better by investing in short-term government securities which can be bought at substantial discounts.

An illustration of the flight from government securities occurred very recently when Treasury certificates totalling $1,800,000 matured. These carried an interest rate of 1¼ percent. The Treasury was willing to exchange them for new one-year certificates paying 4 percent, but actually priced in such a way that they would have yielded in exchange 4.05 percent. Nevertheless, holders of certificates worth one-third of the total amount which had matured refused to accept the exchange and took cash instead. This implied clearly that they could make better investments elsewhere.

Curiously, they could probably do better investing in other types of government or government-guaranteed securities.

For example, they could invest in mortgages guaranteed by the Federal Housing Administration and get a gross return of 5¼ percent. Or they could invest in mortgages guaranteed by the Veterans Administration and get a return of almost 5 percent. In addition, they might be able to get some special payments for such mortgages if they become hard to obtain.

They could even invest in the securities issued by certain federal agencies such as the Federal Land Bank, the Federal Home Loan Banks, the Federal National Mortgage Association, the Federal Intermediate Credit Bank, and the Banks for Co-operatives. All of these obligations yield 4½ percent or more. They are not quite the same as Treasury bonds, but from the standpoint of the investor, they are just about as attractive since they are guaranteed by the Federal Government. To be sure, if there were trouble with one of these agencies, it might take some time to straighten it out, a period during which the investor might have to wait for his money.

The consequence is that the Treasury is required to engage in very curious and, frequently incomprehensible financing. Thus, in effect, the Treasury finds itself paying more for short-term than for long-term money. This, of course, is a reversal of the usual situation.

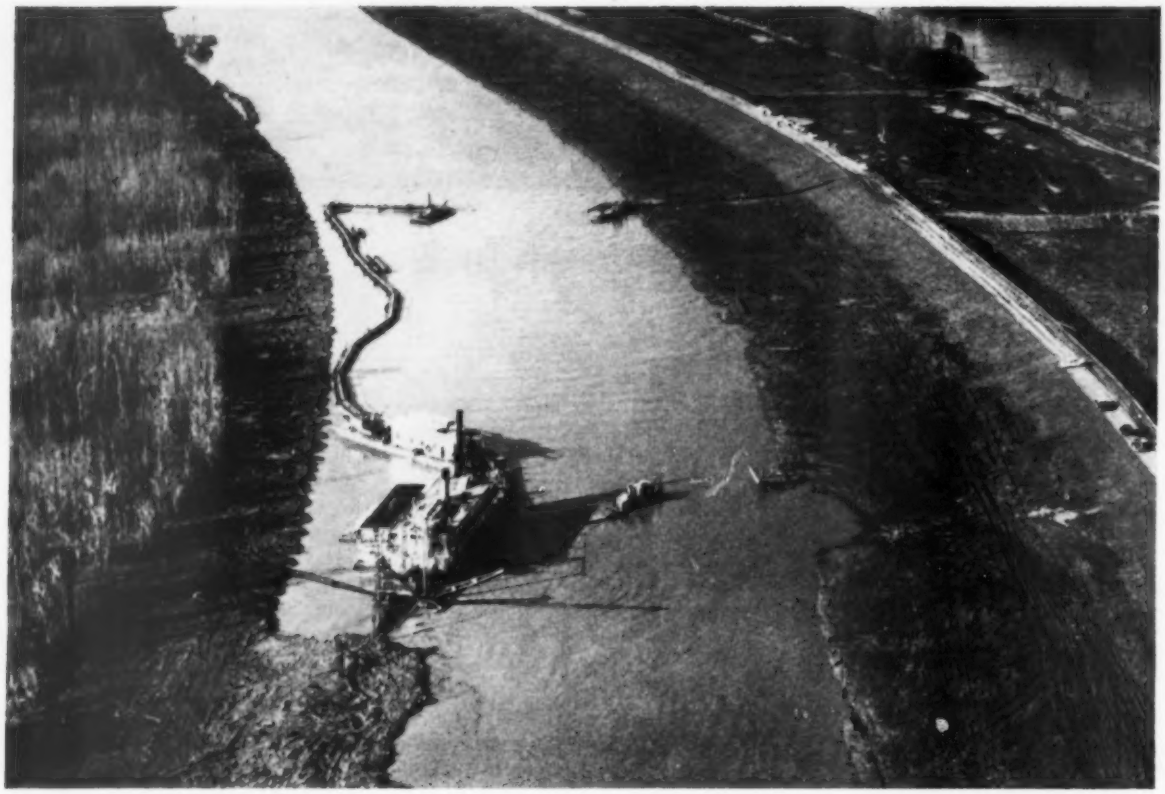
Actually, if the Secretary were free to set interest rates where the money market would require them to be, the situation would be reversed and the debt would be lengthened out. In the long run, it would probably cost the taxpayer less if this were done.

The problem involved in getting Congress to raise the maximum interest rate on long-term financing is that there is powerful opposition to it. An important source of this opposition is in the state and local governments, which also are in the money market, borrowing extensively. They know that a rise in the interest rate on federal obligations would automatically mean that they would have to pay more for money. Since many of the senators and representatives continue to be very closely related to their local governments, they are reluctant to raise the interest rate; it would be an action which would presumably cost those local governments money.

As if this problem of not being able to pay the going price for money is not enough to give the Secretary of the Treasury additional gray hairs, he finds that he is bound by another limitation imposed by Congress, namely, the limitation on the total size of the debt. Congress has always increased this limit when necessary, but it has never done so willingly. In a few cases, the reluctance of Congress to take the action has almost resulted in a financial crisis. Last year, relying on promises made by the Administration that there would probably be a budget surplus, it increased the debt limit by $3,000,000,000 permanently and by an additional $5,000,000,000 for the period of one year.

By the end of this year it was clearly impossible to cut the debt limit back; even further increases were necessary. Increasing the limit, too, is a difficult thing for Congress to do primarily because the debt limit has achieved a kind of symbolic importance. It is pointed to in political campaigns as evidence of fiscal mismanagement. Actually, there is no relationship between the debt limit and the degree of efficiency with which an administration has conducted its financial affairs. Nevertheless, a rise in the debt limit makes a good talking point; and

(*Continued on page* 69)



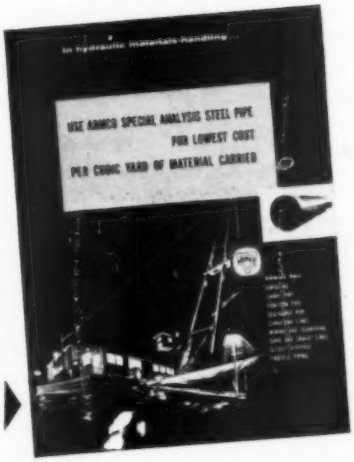
Dredging?

New steels are born at Armco

Armco Special Analysis Steel Pipe can lower your costs

Armco Dredge Pipe is made of special steel developed by Armco to withstand the abrasive materials and rough service normally found in materials handling service. The result? Long-lasting pipe—low cost per cubic yard of material carried.

For more details write us for the illustrated folder on Armco Special Analysis Steel Pipe. Armco Drainage & Metal Products, Inc., 7299 Curtis Street, Middletown, Ohio.



Write for free illustrated folder on Armco Special Analysis Steel Pipe

ARMCO DRAINAGE & METAL PRODUCTS

Subsidiary of ARMCO STEEL CORPORATION

OTHER SUBSIDIARIES AND DIVISIONS: Armco Division • Sheffield Division • The National Supply Company
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Labor Developments

In the Cross-Fire

A RECENT case in which the Circuit Court of Appeals upheld the ruling of the National Labor Relations Board illustrates very neatly both how a contractor can find himself caught in the cross-fire between two labor unions, and how he can avoid this difficulty.

The general contractor on a particular project made an agreement with a specific union which included the usual union shop clause requiring all employees covered by the agreement to be members of the union. In addition, the agreement contained the following clause:

"The terms and conditions of this agreement . . . shall apply equally to any sub-contractor under the control of, or working under contract with, (the) employer on any work covered by this agreement, and said sub-contractor with respect to such work shall be considered the same as an individual employer covered hereby."

The general contractor employed a sub-contractor whose employees were members of a different union. When these workers came on the job to work, the general contractor's employees struck. The general contractor brought about the suspension of the sub-contractor's employees and replaced them with his employees, who were covered by his collective bargaining agreement.

When the sub-contractor and his employees protested, the National Labor Relations Board found that both the general contractor and the union with which he had made an agreement were in violation of the National Labor Relations Act. The general contractor was found guilty of having discriminated against the employees of the sub-contractor, of having interfered with their self-

By S. HERBERT UNTERBERGER

S. Herbert Unterberger and Company
Economists-Consultants on Labor and Industrial Relations
Washington, D.C.-Philadelphia, Pa.

organizational rights, and of having given unlawful assistance and support to the union with which he had a collective bargaining agreement. This union also was found guilty of restraint and coercion and of causing discrimination, by striking against the general contractor to force him to discriminate against the sub-contractor's employees, and by attempting to cause the subcontractor to discriminate against his employees.

On the other hand, some time later, after the general contractor and the union had renewed their agreement, the general contractor again had occasion to use the kind of services provided by the sub-contractor involved in the previous case. In addition to the clause quoted above, that renewed agreement contained the following additional language:

"That if an individual employer shall sub-contract work as herein defined, provisions shall be made in such sub-contract for the observance by said said sub-contractor of the terms of this Agreement."

When offering such work to the sub-contractor, the general contractor insisted that if he were to give the sub-contractor the job, the employees of the latter had to become members of the union with which he had the contract. Since the sub-contractor was not prepared to force his employees to join a different union, he did not get the work. When he complained this time, however, his complaint was not upheld by the National Labor Relations Board.

Instead, the general contractor was found innocent of any violation of the National Labor Relations Act. The distinction which the court drew was that, while the sub-contractor's employees might be denied employment because of their affiliation with another union, this did not come about as a result of a strike by the union, or by pressure exerted on the general contractor, but by a decision of the general contractor himself to comply with his agreement. His refusal to award a sub-contract to the sub-contractor, and the existence of such an agreement with the union did not constitute discrimination by either the general contractor or the union against the employees. The court found that this was only discrimination by one employer against another. Such discrimination is not forbidden by the labor law.

A Novel Kind of Whip-Sawing

Labor unions have frequently been accused of successfully employing whip-sawing tactics. This practice usually involves getting one employer to agree to a particular kind of improvement, but leaving other conditions unchanged, getting another employer to agree to a different kind of improvement, and finally returning to each of them to get the improvement which the other had agreed to. Recently, a new wrinkle has been added to this almost traditional practice.

While the union was bargaining with an association representing a large number of employers in a particular industry, it threatened several of the members of the association with strike action unless they separately agreed to better wage conditions than the union had been able to obtain in the association's bargaining. Having accomplished this, the union then went back to the association and threatened to strike all of the other members unless they met the conditions agreed to by the few firms which had made separate agreements. The association prompt-

(*Continued on page 66*)

precision engineered kilns

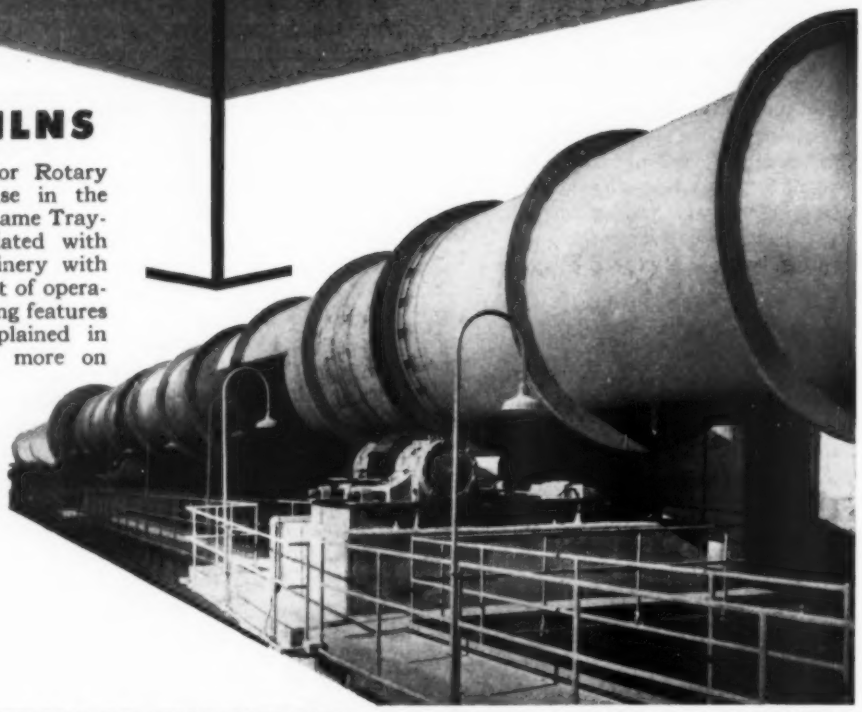
Traylor-made

Auxiliary drive on a 7'-0" dia. x 250'-0" Rotary Kiln in a paper mill.

Plant view of a 9'-6" dia. x 250'-0" Rotary Kiln in a portland cement plant.

ROTARY KILNS

Many hundreds of Traylor Rotary Kilns are in constant use in the processing industry. The name Traylor has long been associated with rugged, dependable machinery with high efficiency and low cost of operation. The many outstanding features of Traylor Kilns are explained in Bulletin No. 1115. For more on Traylor, write today!



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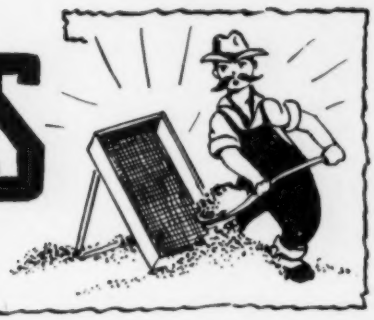
SCREENINGS



By RAY L. SMITH JR.

IN THE HANDLING of an irate customer or prospect, we often make "Much Ado About Nothing"—we stand with our backs to the wall, possessed by an inhibition that the letter we are about to write may cause ill will, often frustrated by the lack of what should be the "right" approach. Thus, in desperation, we are curt without being sympathetic, or we make concessions which are neither sound nor necessary.

There is no reason for fear when you write an adjustment letter. The man who will read what you say is a human being, the same as you are. He feels about the same as you would under the same circumstances. He may not have the facts, but the odds are great that he will be reasonable if given the whole story in a friendly and sincere manner. If he is right, then, of course, there is no problem, for you want to treat him as you would want to be treated. If he is wrong, then it is because he does not understand all the facts. If he is partly right and partly wrong, he will be willing to compromise.

Maybe Terms Would Help

WE ARE a bit intrigued by a recent news item reporting the death of James Zetek, 72, an entomologist who spent 36 years studying the behavior of termites on Barro Colorado Island (a haven for biological study that he helped found in the Panama Canal Zone).

Anyhow, the news item goes on to point out, that, Mr. Zetek discovered a species of termite that could gnaw through 5-in. of concrete. No doubt, all of the structures in Panama are in danger of being undermined because of the termites chawin' away at the foundations. You'd think a diet like that would make 'em a bit lethargic after a while and slow 'em down a notch or two.

Faced with this forthright challenge, we presume the contractors down there, will start pouring all walls at least 10-in. wide. This would leave 5-in. that the termites won't go through. Provided, of course, that the little devils are willing to cooperate in this arrangement. 'Tis a trivial matter, but how does a fellow say "when'" to a termite.

Potpourri and Succotash

A lady entered the sanitarium of specialists for a thorough check-up. One physician examined her eyes; another her throat; a third checked her respirations; a fourth X-rayed her. This went on for several days until she had run the gamut of 14 specialists. Then on the fourth day a little overalled man came into her room carrying a bucket of water, a few rags, some brushes, etc. Now she was truly frightened. "And what are you going to do?" she asked feebly.

The little man smiled at her and said; "I'm going to wash your transom."

"Well, Bill, I hear you've been to a school for stutterers," remarked Jim. "Did it help you?" Bill drew himself up and proudly recited, "She sells sea shells on the sea shore." "Say, that's marvelous!" approved Jim. "Yes, isn't it?" agreed Bill. "B-but it's s-so d-darned h-hard to w-work it into a c-conversation."

A man rushed excitedly into a smoking car of a train, "A lady has just fainted in the next car," he cried. "Has anybody got any whiskey?"

Immediately several flasks appeared. He seized one, tilted it back, took a drink and returned it, saying, "Thanks. It always did make me feel sick to see a lady faint."

Overhead in a hardware store: Said the customer to the proprietor, 'Do you have any four-volt, two-watt bulbs?'

'For What?' asked the proprietor.

'No, two.'

'Two what?'

'Yes.'

'No.'

A tongue twister is a group of words that get your tang all tonguled up.

Upon entering the room a woman recognized the celebrity who was to address her group pacing madly back and forth.

"Are you always nervous like this before you make a speech?" she asked.

"Nervous? Why no, I never get nervous," he replied.

"Oh, no?" observed the woman. "Then what are you doing here in the Ladies' Rest Room?"

Then there was the hotel guest who had trouble opening his suitcase and phoned the desk to send up a screwdriver. In due time a waiter appeared with a tray of vodka and orange juice. The guest was so mad he drank it.

The proprietor of a cigar store was worried. His competitor was attracting crowds at his window by employing a vivacious brunette to sit there and roll cigars, at the same time smiling at the boys outside.

After considerable thought the proprietor hit upon an idea. The next morning a blond was rolling cigars in his window—but with her back to the street. There soon was a crowd inside the store.

Doctor Theo: "I've examined you thoroughly, but I can't seem to find the cause of your trouble. However, it's probably due to drinking."

Patient: "Oh, that's okay Doc. I'll come back sometime when you're sober."

6 YARDS

A ten or twelve yard tandem-axle truck loaded in 60 seconds!

***Two* 23-ton semis heaped in three or four minutes!**

***Two* passes for the smaller truck, five for the two bigger ones *combined*.**

Someone's dream? Not any more! It's been standard practice at Stony Creek Stone Co..pany's pit near Indianapolis ever since last summer. That's when their big *6 yard* Model 375A Michigan Tractor Shovel went to work.

Big production cuts costs, reduces truck waiting time

Stony Creek's problem up until then had been a common one: "How to hold down loading costs, and reduce truck waiting time in the face of rapidly-expanding customer demands." Fast rubber-tired Tractor Shovels had long since replaced cranes and crawler-loaders. The biggest rubber-tired units available, 2¼ yds, were in use. But, production requirements were calling for still more loading capacity. At that point, Company General Manager Dick Irving got a big idea. Visiting the Clark booth at the Road Show, he saw the new 6 yard Model 375A Michigan. "There," he thought, "is a Tractor Shovel that could *really* do a job for us It could give us enough capacity to replace two smaller Tractor Shovels *plus* handle all the expansion we anticipate for years to come."

Michigan output totals 2,500 tons daily

Today, the big Michigan and its *one* operator do the work of two or more smaller Tractor Shovels. Michigan output averages 2,500 to 3,000 tons of crushed limestone every day. "Despite its size, I'd rather run this big Tractor Shovel than any other," says Operator Carroll White. "It handles easily. It moves and responds just as fast as any smaller loader. Its big low-pressure tires really absorb the bumps. And its smooth ride sure cuts down on the fatigue you'd expect from a 10-hour day—even though I alone load as much stone as two men

Notice how much this big new Michigan *looks* like the smaller Michigans you see everywhere. It handles as easily as they do, too—with power steer, power-shift, torque converter, planetary wheel drive-axles standard. Its entire all-Clark power train is the same design as that job-proved in the 11,000 Michigans now in the field.

Specifications	Model 375A	Model 275A
Bucket capacity (standard SAE ratings)	6 yards	4 yards
Lifting capacity	30,000 lbs.	22,000 lbs.
Weight	61,000 lbs.	46,000 lbs.
Speeds (forward and reverse)	0-25 mph	0-28 mph

PER PASS

did when the pair of 2¼ yard rubber-tired Tractor Shovels were working."

Five passes heap two semis

And that's another reason White prefers the 375A. Higher production! With the smaller machine, White needed at least four minutes and eight passes to load one 23-ton haul truck. With the Model 375A, White regularly loads *two* 23-ton semis in the same time or less—in only 2½ passes each. Two-and-a-half passes? Yes, White does it like this: Two heaped loads go into the truck. On the third load, precise hydraulic controls let White hold bucket so that only half its load is dumped. That fills one truck. The other half-load is fed into the second truck. Then, two more full loads sends this truck on its way too. Thus: five passes, two truck-loads.

Efficiently loads small trucks, too

White even prefers to load a *five-yard truck* with the 6-yard Michigan. Here, the Tractor Shovel bucket is allowed to extend beyond the back end of the truck when dumping. May *sound* wasteful, but before the loaded truck can shift into second, one quick swipe of the Model 375A bucket has cleaned all spillage.

Model 375A easy to maintain

White feels the big Model 375A is as easy to run as *any* Michigan Tractor Shovel—perhaps even a little easier because of its greater weight and better stability. The new Tractor Shovel is easy to take care of, too. In only 10 minutes each morning, White makes his daily maintenance check. Proper care, plus rugged construction, have held repairs to virtually nothing. In the many months Stony Creek has had the Model 375A, there has been *no maintenance at all* on the job-proved Clark power train.

Clark distributors are ready to *show you* this big new dependable 6 yard Michigan, as well as the new almost-as-big 4 yard Model 275A. Call to arrange a date.

Michigan is a registered trade-mark of

CLARK EQUIPMENT COMPANY
Construction Machinery Division
2479 Pipestone Road
Benton Harbor 10, Michigan
In Canada: Canadian Clark, Ltd., St. Thomas, Ontario

CLARK® EQUIPMENT

Enter 16 on card, page 255

CASE HISTORIES
Preloading of the New Departure double row ball bearing eliminates progressive fretting corrosion problem in[illegible]d by engine vibra[illegible]

Photo: Courtesy Warner Electric Brake & Clutch Co.

Preloaded Double Row Bearings Solve Fretting Corrosion Problem In Electric Clutch!

CUSTOMER PROBLEM:

Fretting corrosion of automobile air conditioner electric clutch bearings due to engine vibration. Application requires compact bearing design and positive lubricant sealing.

SOLUTION:

N/D Sales Engineer, working with the manufacturer, suggested replacing two single row bearings with one internally preloaded New Departure Double Row ball bearing with shield and Sentri-Seal. The preloaded angular contact construction of these New Departures offered maximum resistance to combined radial and thrust load deflections, plus freedom from effects of engine vibration. Problem of fretting corrosion was eliminated by producing bearings with accurately determined internal compression. Lubrication of bearing was assured for life by New Departure's exclusive Sentri-Seals . . . dirt was sealed out under extremely contaminating conditions. In addition, the compact size of these double row bearings eliminated a tough assembly problem . . . and provided savings in both space and costs.

When you're faced with a bearing problem, why not call on New Departure. Chances are there's a precision N/D high production bearing that will solve it. For more information, write Department 0-7.

Available through United Motors System and its Independent Bearing Distributors.

NEW DEPARTURE

DIVISION OF GENERAL MOTORS, BRISTOL, CONN.

NOTHING ROLLS LIKE A BALL

If any of your work is in sandy soil, you well know all the maintenance tracks need. This New Jersey company figured they spent $22,000 in parts alone every year. So they switched to rubber, now

SAVE BIG REPAIR BILLS, GET MORE WORK DONE!

Bennett Sand & Gravel Company, Manasquan, New Jersey, qualify as *real experts* on track wear. All their work is in gravel or high-silica sand, which forms the floor of their 1,000 acre quarry. In the past, they figured re-bushing and new sprockets were needed on each of their crawler-dozers twice a year. Complete sets of rails had to be replaced every eight months. Rebuilding jobs on three crawler dozers cost over $22,000 per year *in parts alone*. Shop time for the track repairs totalled *400 to 500 man-hours per year*. To eliminate this high cost, Bennett decided to try rubber. Their local Michigan Distributor heard about it, got permission to demonstrate a Model 180 Tractor Dozer. Bennett management liked it so well, they insisted it stay right on the job.

"Tires don't wear out"

The Michigan started to work in summer, 1956. To date, the tires show virtually no wear. Paul Bennett, Jr., Company Vice President, says he expects them to "last indefinitely." For comparison, he points to a tractor loader which has worked constantly and still has original tires after 6 years. A bottom-dump hauler has original treads after 9 years. So, Bennett figures, the tires on their Michigan dozer, with its steerable wheels, should be good for thousands of hours. The machine does everything, too . . .

Spread at 6 scattered dumps

Its regular jobs include:

1. Keeping three big sand dumps pushed off. Types of sand: mason, concrete and coarse grade. Job was once tried by another make of rubber-tire dozer, but it bogged down hopelessly in the often-wet sand.
2. Spreading truck-dumped gravel at three dumps: pea-size, ⅝" and 1" stone. Major advantage in this operation is way Michigan's low-pressure tires don't crush the gravel . . . a real problem with crawlers when selling gravel for state work.
3. Cleaning spillage from haul roads.
4. Cleaning around washer.
5. Building roads at secondary pit five miles away. Unit gets to this assignment *under its own power* at 27 mph.

"Easier to run than crawlers"

"We do about 50 kinds of odd jobs, as well," says John Gifford, a dozer operator with Bennett *since 1940*. "The Michigan is a pleasure to run all the time. Hit a good-sized stone while driving a crawler, for instance, and you really get a jar. In our Michigan, you roll right over it, stay in perfect control. It's a cinch to operate the Michigan after running a crawler—and a lot faster too. *Michigan gets around the plant as fast as a truck*, handling dozens of jobs—doing well at all of them!"

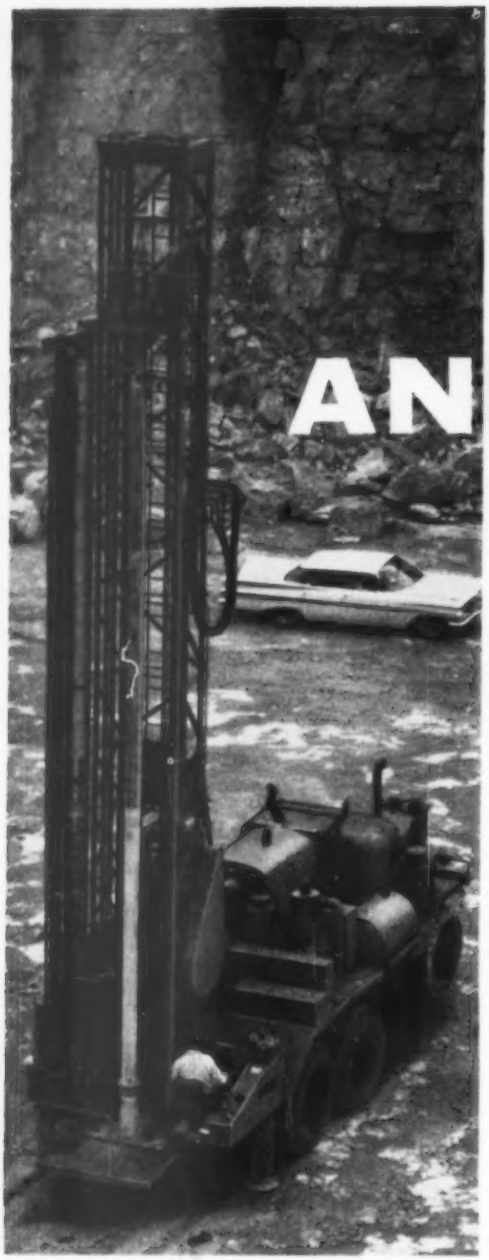
Available on lease-purchase

If slow speeds and sand-in-the-tracks are grinding away at your profits, it will pay you to get full facts on this Dozer. Your local Michigan Distributor will be glad to arrange a trial demonstration—*you* pick the job. You *needn't* keep the Michigan we demonstrate . . . but we guarantee if you have any work in sandy soil, or any scattered odd jobs, you'll be tempted. All sorts of purchase plans can be arranged . . . including no-money-down, pay-as-you-profit lease-purchase.

Michigan is a registered trade-mark of

CLARK EQUIPMENT COMPANY
Construction Machinery Division
2479 Pipestone Road
Benton Harbor 36, Michigan
In Canada: Canadian Clark, Ltd.
St. Thomas, Ontario

CLARK® EQUIPMENT



NEW REICHdrill T-850 Heavy, mounted on a large, off-highway truck. This Model is designed to drill 10⅝" blastholes in extremely hard formations. It is turbo-charged for high altitude service.

CHICAGO PNEUMATIC TOOL COMPANY

ANNOUNCES

TO THE MINING INDUSTRY ITS NEWEST MANUFACTURING AND SALES FACILITY:

REICHdrill
DIVISION: CHICAGO PNEUMATIC TOOL CO., NEW YORK

Formerly:
Reich Bros. Manufacturing Company, Inc.

Chicago Pneumatic has expanded its engineering and manufacturing capabilities by the acquisition of The Reich Bros. Manufacturing Company, Inc. with plants located in TERRE HAUTE, INDIANA, and GLASGOW, SCOTLAND.

The acquisition of its new REICHdrill Division affords Chicago Pneumatic an unexcelled diversification in the field of drilling equipment.

REICHdrills, both truck and crawler mounted, are hydraulically-powered rotary blasthole drills. For detailed information concerning REICHdrills, or other CP Drilling Equipment, write *Chicago Pneumatic Tool Company, 8 East 44th Street, New York 17, N.Y.*

Chicago Pneumatic

HYDRAULIC TOOLS • ROCK DRILLS • DIESEL ENGINES • AIR COMPRESSORS • PNEUMATIC TOOLS • VACUUM PUMPS • AIR BLAST BITS

News of the Industry

Ideal Reorganization Plan Proposes 80% Acquisition Of Volunteer Portland

At the recent quarterly meeting of the Ideal Cement Company, the board of directors adopted a plan of reorganization subject to approval by a majority of the owners of outstanding stock.

Under this plan, Ideal would acquire at least 80 percent of the outstanding stock of Volunteer Portland Cement Company, Knoxville, Tenn.

Volunteer's board of directors also approved the plan. If the proposal is accepted by stockholders of both firms, the merger will add 3,000,000 bbl. of cement annually to Ideal's capacity, for a new total of 37,000,000 bbl.

Ideal stock would be exchanged for the 200,000 outstanding Volunteer shares at the rate of 3⅜ Ideal shares for one Volunteer share.

Flintkote Company Acquires Glens Falls Portland Cement

The acquisition of Glens Falls Portland Cement Company, Glens Falls, N. Y., by Flintkote Company of East Rutherford, N. J., was recently completed after shareholders of the cement firm approved the merger at a special meeting. Glens Falls will be operated as a Flintkote division; no change is anticipated in the company's management or method of operation.

This is the tenth such acquisition by Flintkote since February, 1956, when the building products manufacturer embarked on an expansion and diversification program. During this period, the firm has completed or has under construction nine new plants or additional plant facilities. Flintkote now operates 79 plants and mills, including a cement plant at Louisville, Ky.

Glens Falls Portland Cement Company operates a 1,800,000-bbl. mill. Sales in 1958 were reported at $5,185,482, with a net profit of $1,250,063. Figures reported for Flintkote in 1958 were $156,172,639 in sales and $7,536,066 in net profits.

• The Jacksonville Fla., sales district personnel of National Gypsum Company were recently given the company's top sales award for the second straight year. James E. Peoples (left), Jacksonville district manager, accepted the Melvin H. Baker trophy from Melvin F. Cerruti, national vice-president, at the award ceremony.

Marietta Concrete Co. Joins American-Marietta Concrete Products Division

Marietta Concrete Corporation, Marietta, Ohio, has announced the merger of its business and operations with American-Marietta Company. It will be operated as a part of the parent company's Concrete Products Division.

F. Leonard Christy, president of Marietta Concrete, will continue as the chief operating officer. R. Neil Christy will maintain responsibility for engineering and production, and the entire organization will remain intact.

Marietta Concrete also operates plants in Jamestown, N. Y., and Baltimore, Md.

Net earnings of the American Cement Corporation for the first quarter of 1959 totaled $662,349, almost double the earnings of $358,309 reported for the same quarter in 1958.

Coming Events

July 23-24, 1959 — Hot Springs, Va. Directors meeting, National Crushed Stone Association. The Homestead.

July 19-22, 1959—White Sulphur Springs, W. Va. National Bituminous Concrete Association. The Greenbrier.

September 14-17, 1959—Denver. Metal-mining industrial minerals convention, American Mining Congress.

September 27-30, 1959 — Lake Placid. Semi-annual meeting, board of directors, National Sand and Gravel Association. Lake Placid Club.

October 1-3, 1959—Philadelphia. Operating meeting, National Lime Association. Sheraton Hotel.

October 11-16, 1959—San Francisco. Third Pacific Area national meeting, American Society for Testing Materials. Sheraton-Palace Hotel.

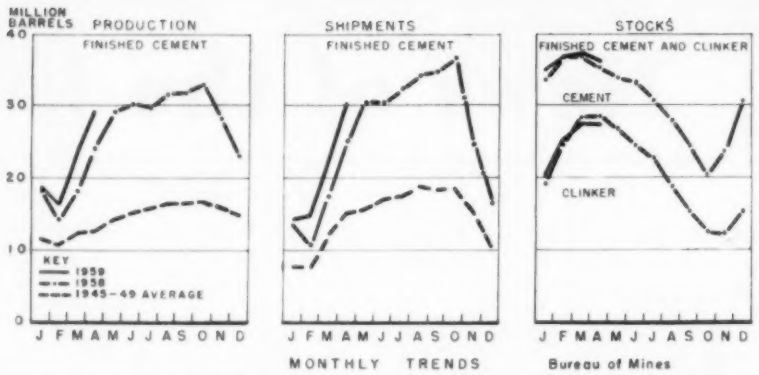
October 29-30, 1959 — Boca Ratan, Fla. 42nd annual meeting, National Slag Association. Boca Ratan Hotel and Club.

Construction Put in Place Reaches $4.6 Billion in May Setting Record for Month

New construction activity increased seasonally in May, and the $4,600,000,000 total of work put in place was 15 percent above May, 1958, setting a new record for the month, according to preliminary estimates prepared jointly by the U. S. Department of Commerce and Labor.

On a cumulative basis, expenditures of $19,700,000,000 for the first five months of 1959 also set a new high for this period that was 13 percent above the comparable period of 1958. Private construction outlays of $13,900,000,000 were dominated by spending for work on new housing, which was 36 percent above that for the same period last year.

In the public sector, total expenditures of $5,800,000,000 through the end of May, 1959, were 16 percent over the previous January-May high reached last year. Most of the public construction types contributed to this record-setting pace with the notable exception of educational building, which was three percent under 1958, when the first five months are compared.



SUMMARY—Production of finished portland cement in April, 1959, as reported to the U.S. Bureau of Mines, totaled 29,093,000 bbl., an increase of 21 percent over April, 1958. Mill shipments in April, 1959, totaled 30,135,000 bbl., an increase of 19 percent over April, 1958. Stocks of 36,381,000 bbl. of finished portland cement on hand April 30, 1959, were 3 percent more than those on hand April 30, 1958. Clinker production during April, 1959, totaled 29,134,000 bbl., an increase of 21 percent over the April, 1958, figure.

PRODUCTION—One hundred and sixty-six (166) plants in 37 states and Puerto Rico reported a production of 29,093,000 bbl. of finished portland cement during April, 1959, compared with 24,001,000 barrels produced in April 1958.

Production of clinker during the month of April, 1959, was 29,134,000 bbl., compared with 24,171,000 bbl. during the same month last year.

High-early-strength portland cement in April, 1959, totaled 1,130,000 bbl., an increase of 32 percent over the April, 1958, production.

Prepared masonry cement production in April, 1959, of 1,618,000 bbl. increased 27 percent over the April, 1958, production.

SHIPMENTS—Mill shipments of finished portland for April, 1959, totaled 30,135,000 bbl., compared to 25,318,000 bbl. in April, 1958.

In April, 1959, shipments were higher in twenty-one (21) districts and lower in two (2) districts than in April, 1958. The greatest increases were in southern California, Georgia-Florida, and eastern Missouri-Minnesota-South Dakota districts.

Mill shipments at high-early-strength portland cement totaled 1,374,000 bbl. in April, 1959, a 19 percent increase over the 1,154,000 bbl. shipped in April, 1958.

Mill shipments of prepared masonry cement in April, 1959, totaled 1,607,000 bbl., an increase of 17 percent over the 1,376,000 bbl. shipped in April, 1958. Over one-half of these shipments were from mills in the northern states east of the Mississippi River. Prepared masonry cements are shown in 376-pound barrels although they are sold in barrels of varying weights.

STOCKS—Mill stocks of 36,381,000 bbl. of finished portland cement were on hand April 30, 1959, an increase of 3 percent over the 35,170,000 bbl. on hand April 30, 1958. Stocks of clinker on hand April 30, 1959, totaled 27,371,000 bbl., a decrease of 4 percent from the 28,409,000 barrels on hand April 30, 1958.

FIRST FOUR MONTHS OF 1959—For the January-April, 1959, the volume of production of finished cement amounted to 88,736,000 bbl., compared with 74,394,000 bbl., in the comparable period of 1958. Total shipments for the first four months of 1959 are reported at 82,347,000 bbl.; in the same period of 1958 total shipments were 67,251,000 bbl.

Cement Transport Firm Also Has Sand-Gravel Plants

Southern Cement Transport Company of Okay, Ark., a wholly-owned subsidiary of the Braswell Sand and Gravel Company, Inc., recently began operating 10 tank trucks in the distribution area including Arkansas, northern Louisiana, northeast Texas, and eastern Oklahoma. Braswell Sand and Gravel Company, headquartered in Shreveport, La., operates plants at Wilton, Ark., and Minden, La.

The transport fleet will eventually have 30-40 of the 10-wheel 107-bbl. capacity trucks. The firm distributes cement for local Ideal plants.

At Texas Crushed Stone Company's Austin, Tex., quarry a Lorain Moto-Loader is used for loading crushed limestone from stockpiles. Mounting 2-cu. yd. buckets, each Lorain handles from 1,800 to 2,500 cu. yd. in a 10-hour day, digging from a 10-ft. to 40-ft. bank.

Total unit shipments made by American Cement Corporation during the first four months of this year were 19 percent ahead of the same period in 1958. Earnings for the first quarter increased from $412,116 to $770,671.

The Colorado Bureau of Mines reports that production has begun at a perlite plant now under construction near Silver Cliff, Colo., for Flexmore, Incorporated. Construction of a mica processing plant for Hi-Lo Minerals Corporation near Howard, Colo., was also reported.

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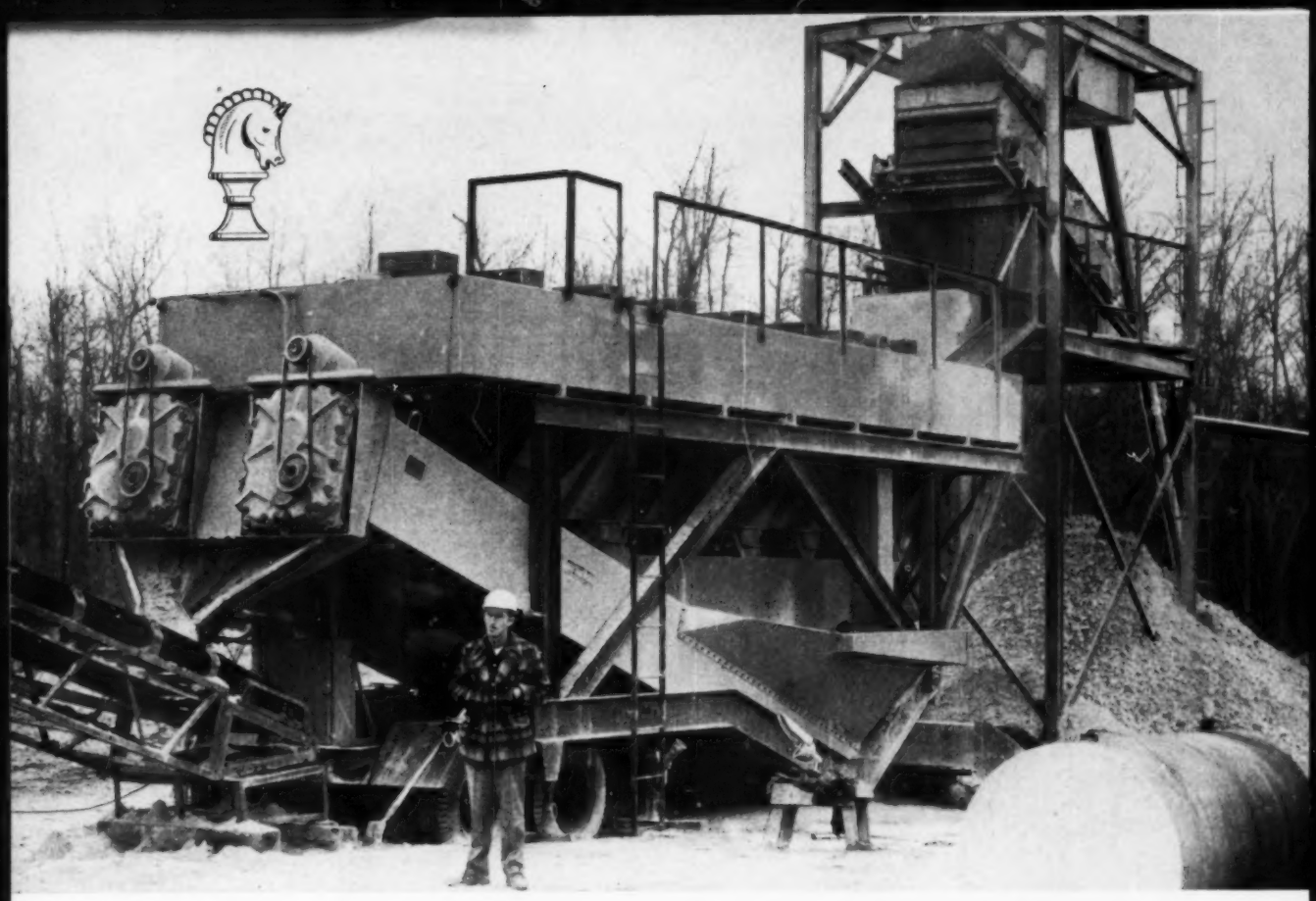
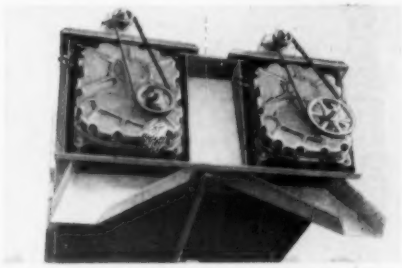


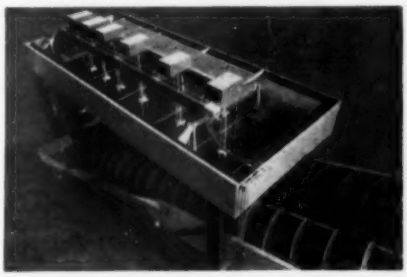
"Real Low Cost Per Ton"

Says Grady Jordan, co-owner of A & B Materials Co., Warner Robbins, Ga.

"Our Eagle Portable Sand Section Is Producing 1500 Yds. Per Day of Air Force Specification Sand — And At A Real Low Cost Per Ton" Mr. Jordan, shown in front of his plant, further states, "With our Eagle Portable Washing-Classifying-Dehydrating Section we can quickly pull up stakes and move to another job site when we finish up here. With proper adjustment of the Water-Scalping-Classifying Tank and the two screw units we can readily meet specifications." Material is for air base runways. Cornell Young Co., long a user of Eagle Equipment, is also supplying material for this project. Get the facts on Eagle "Portables"—send for Catalog 58.



Both screws on A & B Materials Co.'s portable section are producing concrete sand—where each screw is to produce a different gradation the delivery chutes can be quickly switched as shown above.



The Eagle Portable Section has a complete water scalping-classifying tank with fully automatic bleeder valves and metering "splitter" gates just like a stationary sand washing-classifying section plus two independent screw units which can produce the same gradation or each a different gradation.

SINCE 1872

EIW

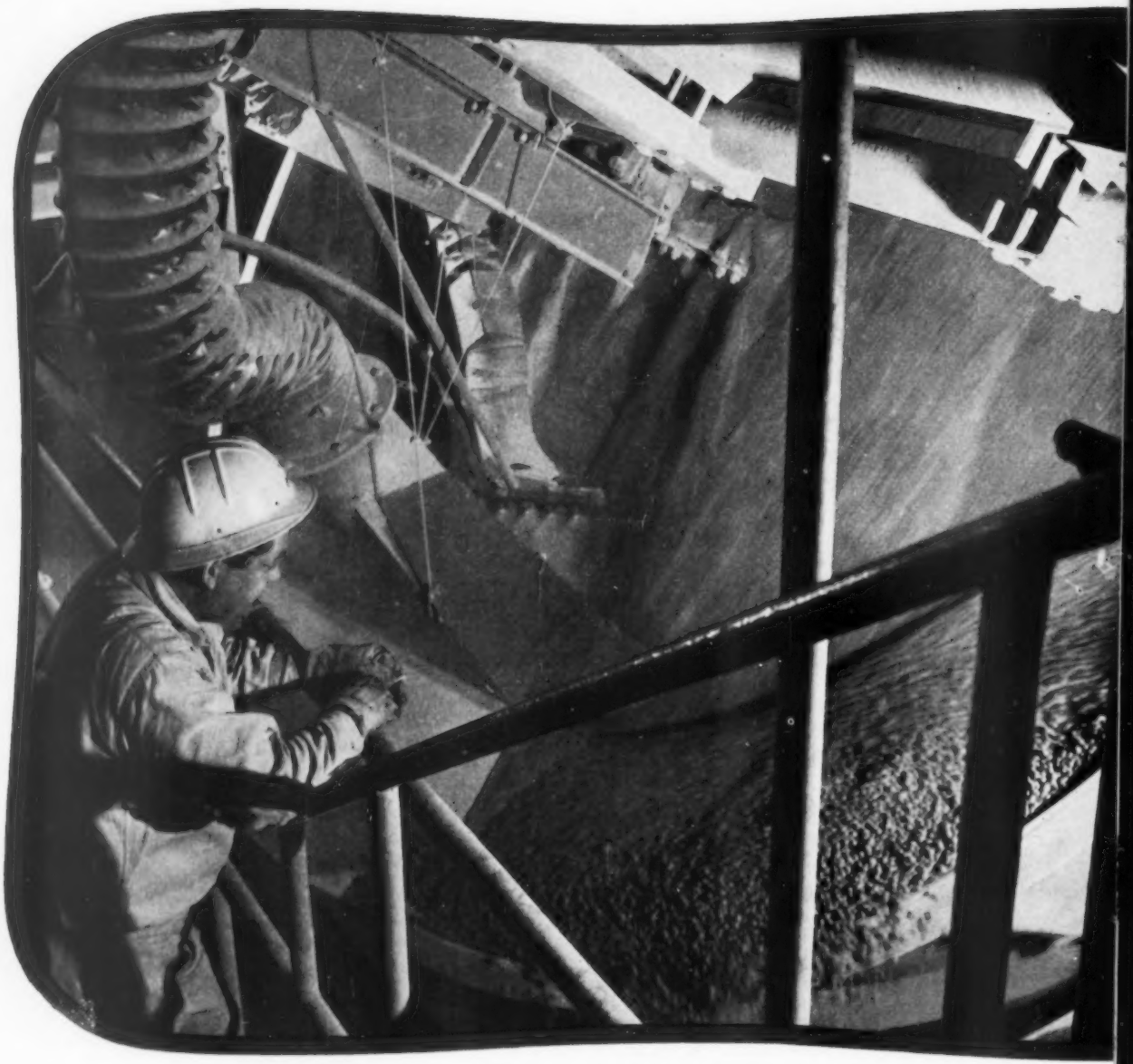
EAGLE IRON WORKS

EAGLE IRON WORKS

ENGINEERS • MANUFACTURERS

133 HOLCOMB AVE., DES MOINES, IOWA

Factory-Trained Distributors Everywhere



Pellets formed in revolving pan are fed to traveling grate for drying and pre-calcining.

Pellets to profits

"COORDINEERED" Allis-Chalmers Equipment Paves Way to Increased Capacity at Diamond Portland Cement Co.

Progressive — that's Diamond Cement at Middle Branch, Ohio. Modernization — $5,000,000 worth — has meant an additional million barrels of *low-cost* production for this relatively small, but aggressively on-the-grow operation.

Significantly, Allis-Chalmers supplied much of the major equipment in this modernized plant. Wheel horse in the operation is a complete *ACL* kiln system — pelletizer to clinker cooler. Other Allis-Chalmers equipment includes two vibrating screens and a pair of 1000-hp ball mills. Associated electrical equipment was also supplied by Allis-Chalmers.

"Heads-Together" Approach to Application

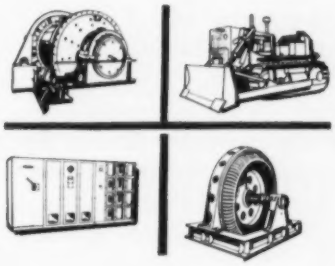
Allis-Chalmers manufactures a most diversified line of processing and electrical equipment. Each product department is staffed with research, design, manufacturing and application specialists. "Coordineering" results from an interdepartment exchange of ideas and the correlation of specific skills. Integration of thinking, planning and engineering precedes integration of equipment.

Help for You or Your Consultants

Arrange a meeting with your A-C cement team. See your local representative or write Allis-Chalmers, Industrial Equipment Division, Milwaukee 1, Wisconsin. In Canada, write Canadian Allis-Chalmers Ltd., Box 37, Montreal, Quebec.

Allis-Chalmers Products for Cement Industry

Earth-Moving Equipment
Kilns Grinding Mills Crushers
Vibrating Screens
Dryer-Coolers Motors Control
Switchgear
Unit Substation Steam Turbines



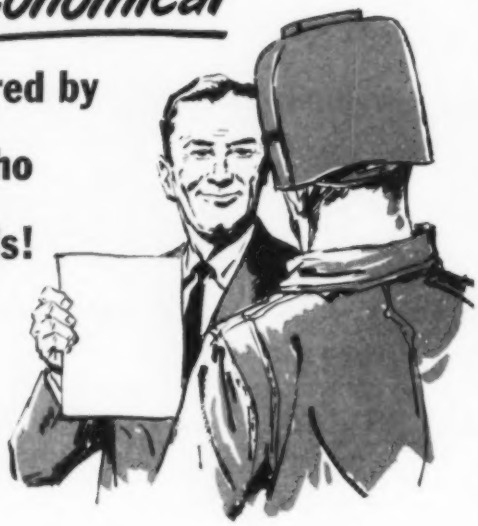
ALLIS-CHALMERS A-C A-5928-CM

ACL is an Allis-Chalmer trademark.

Ranite Hardsurfacing Rods

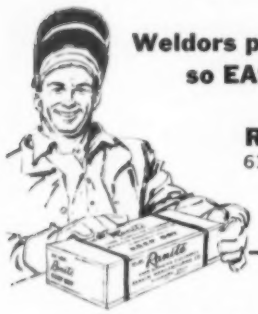
are *So economical*

they're preferred by the men who pay the bills!



MEN RESPONSIBLE FOR COSTS—men who must hold expenses in line and show a profit—have seven important reasons for preferring Ranite metallic-coated hardsurfacing rods:

1. **Longer wearing parts**—reduced downtime—increased production.
2. **Repair costs reduced**—Ranite-coated surfaces can be cut with oxy-acetylene torch when necessary for repair.
3. **More than 80% recovery rate**—no unnecessary flux in Ranite coating, maximum amount of coating enters the weld, no slag formed.
4. **Rapid deposition rate**—maximum metal deposited per man-hour. No splatter loss.
5. **Minimum tendency to check**—Ranite rods are alloyed with coefficient of expansion and contraction approximating that of parts to be hardsurfaced.
6. **Deposits firmly bonded to base metal**—Ranite can be applied to all steels, most cast irons and manganese steel *without* stainless bonder.
7. **Smaller inventory needed**—just five Ranite rods handle the great majority of all jobs. (Types A, BX, C, D and No. 4.)



Weldors prefer Ranite Rods because they're so EASY TO USE. Ask *your* weldors!

RANKIN MANUFACTURING CO.
616 S. Marengo Ave., P. O. Box 631, Alhambra, Calif.

Sold through your local Ranite Distributor

Originators and pioneers of metallic-coated rods—since 1938

Ranite
WELDORS' NO. 1 CHOICE FOR HARDSURFACING

Enter 26 on card, page 255

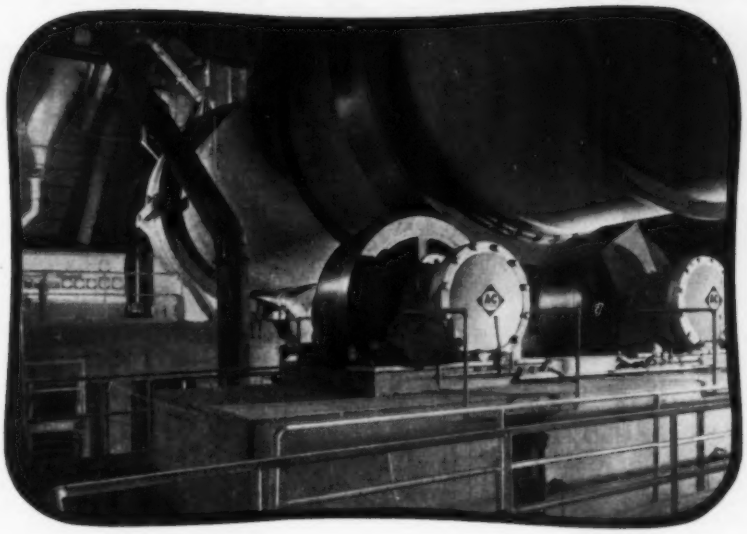
Our Cover Picture

● Take impressive modern electronic technology, mix it with basic operating "savvy," and one result can be that illustrated on the front cover of PIT and QUARRY this month. Here at the Oro Grande plant of the Riverside Cement Company division of American Cement Corporation, a process-control digital computer utilizes linear programming techniques to compute, select, and control the various components of raw material being placed in storage for ultimate raw milling. The computer is also "cost conscious." Once "told" the costs, as well as the analyses of the materials going into the piles, it will provide the answer as the most economical blend; i.e., it may indicate the use of a greater proportion of lower-cost clay-shale of high iron content as a replacement for higher-cost purchased hematite. A detailed description of this phase and the interesting overall operations starts on p. 122.

Gypsum Production Up 19% In First Quarter of 1959

Domestic mine production of crude gypsum during the first quarter of 1959, as reported to the U. S. Bureau of Mines, totalled 2,327,396 short tons, 19 percent greater than the tonnage reported for the corresponding period of the previous year. Calcined gypsum production and imports were 13 percent higher.

Sales of uncalcined gypsum products were 31 percent more than in the preceding first quarter, the largest tonnage gain being in portland cement retarder. Industrial and building plasters increased 11 and 2 percent respectively. All industrial plasters increased. In the building category declines were reported for roof-deck plasters and plasters to mixing plants. Prefabricated products rose 15 percent.



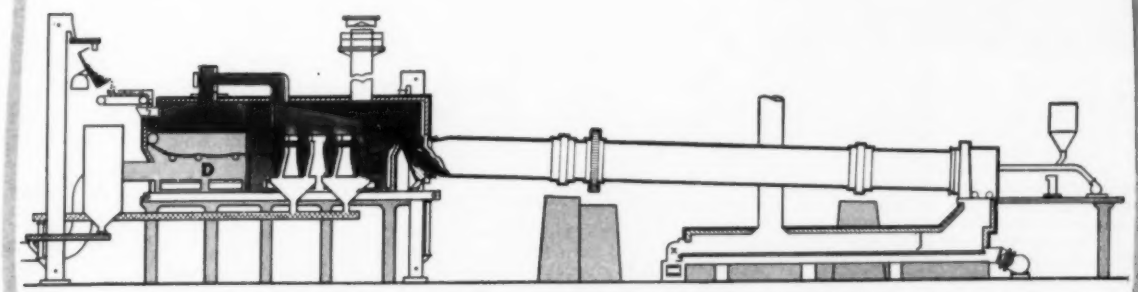
ACL pellet process cleans up cement making

Pelletizing of raw materials makes possible the dust-free operation of the *ACL* "double-pass" traveling grate system.

Along with clean production, making cement with pellets affords a barrel of bonus benefits — product reclamation, maximum burning efficiency, power savings, small space requirements.

How *ACL* "Double-Pass" System Works — In first pass (A to B) 1800° gas from kiln partially calcines feed in section nearest kiln. Gas temperature is reduced to 500°. Cyclones reclaim air-borne dust. In second pass (C to D) green pellets are dried and heated to about 500°. Gas stripped of heat and dust is exhausted in a mere wisp.

For the complete story, see your A-C man or write Allis-Chalmers, Industrial Equipment Division, Milwaukee 1, Wisconsin. In Canada, write Canadian Allis-Chalmers, Ltd., Box 37, Montreal, Quebec.



ACL is an Allis-Chalmers trademark.

ALLIS-CHALMERS

A-5930-CM

SAUERMAN NEWS briefs

SAUERMAN BROS., INC.,
634 South 28th Avenue, Bellwood, Illinois
Linden 4-4892

4-YARD DRAGSCRAPER ELIMINATES A SHIFT AND UPS PRODUCTION

At the Union Sand and Gravel Co., a Sauerman DragScraper Machine gives Union the production necessary to supply increased plant demand in just one shift. Two shifts were required with their previous installation when a smaller Crescent and hoist were used.

The 4-yd. DragScraper delivers 175-cu. yds. or about 250 tph. when digging 400 ft. from the hopper. Power is supplied by a Sauerman three-drum hoist which has an inhaul speed of 500 fpm. with loaded bucket and a 1,000 fpm. backhaul speed. A 30-ft. tubular steel mast equipped with Durolite blocks forms the head end assembly. Operating cables from the hoist are reeved through the head end Durolites to the rapid-shifting tail bridle system 500 feet away.

A trolley and tail block travel the tail bridle cable. Lateral shifting of the trolley by the third drum changes the Crescent DragScraper's line of operation.

(Condensed from Sauerman News No. 144.)

Slackline Delivers From Pit To Pile On 850-Ft. Span For About 6¢ per Ton

For over thirty years, Louis Marsack and Sons have used Slackline Cableways to dig and haul sand and gravel to their plant. They are presently using two 1½-yd. Slacklines which work at right angles and deliver material to adjacent stockpiles. Both are working on 850-ft. spans. One is digging 60 ft. below water and the other in 90 ft.

Operating costs are estimated to be about 6¢ per ton. This includes fuel, labor and maintenance.

The stockpiles are rehandled by a crane to a grizzly hopper feeding a conveyor to the plant. The setup is ideal as it permits blending the material obtained from the two different deposits.

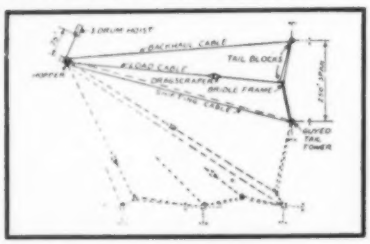
The Marsack's newest Slackline is a torque converter diesel powered unit. This machine is also equipped with the new Slackliner Bucket which is designed for tough-to-dig deposits. Both Slackline Cableways are air controlled.

(Condensed from Sauerman News No. 153.)

DragScraper Supplies Gravel for 82 Miles of Turnpike

More aggregate production was needed by Southern Michigan Materials, Inc. to supply structural and, upon completion, the maintenance and incidental needs for 82 consecutive miles of the Ohio and Indiana Turnpikes.

This demand was met with a new plant and a 5-yd. DragScraper which supplies gravel at the rate of about 275 tph. Digging goes to a depth of 75 to 80 ft. Power is provided by a Sauerman three drum hoist driven by a 325-hp. diesel. The rapid-shifting bridle provides a means of changing the DragScraper's line of operation by placing the tail block attached to the bridle in another position along the 250-ft. span between the two steel tail towers.



The hoist is pneumatically controlled by the operator from the hoist house. His location gives him excellent visibility of the entire pit and most of the plant.

(Condensed from Sauerman News No. 145.)

MORE NEWS AND INFORMATION

Issues of Sauerman News giving greater detail about the installations on this page are available on request. For full information, tell us your interest or requirements and ask for catalog. Contact Sauerman Bros., Inc., 634 S. 28th Ave., Bellwood, Ill.

Enter 28 on card, page 255

J. C. Lincoln Succumbs After Distinguished Career With Lincoln Electric Co.

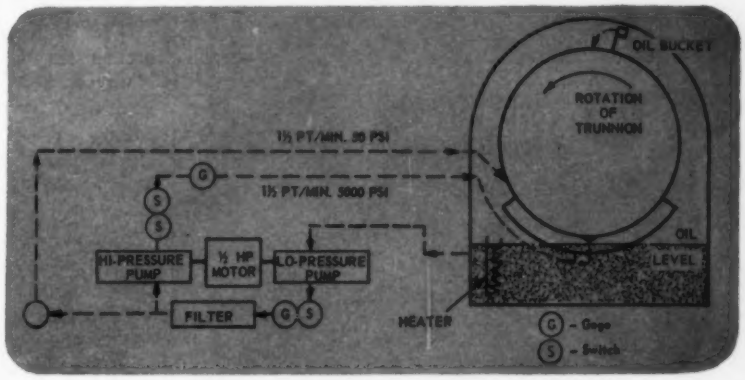
J. C. Lincoln

John Cromwell Lincoln, 92, founder of the Lincoln Electric Company, passed away May 25 at his home in Scottsdale, Ariz. He had been president of the firm from 1906 to 1928, when he became board chairman and was succeeded as president by his brother, James F. Lincoln.

The Lincoln Electric Company made alternating current motors and welders when it was founded, but it is principally known for the manufacture of welding devices today. Mr. Lincoln developed many of the firm's products and was issued more than 50 patents for electrical devices, among them the variable-speed motor. He was a pioneer in the development of ductile welds.

During his career he was an advocate of the single-tax theory of Henry George and in 1924, he ran for the vice-presidency of the United States on Commonwealth Land Party ticket. In 1957 he wrote *Ground Rent, not Taxes: The Natural Source of Revenue for the Government*, a modernized version of the single-tax theory.

Construction Aggregates Corporation has moved its headquarters offices to new quarters on the 11th floor of the 120 South LaSalle Building, Chicago 3, Illinois.



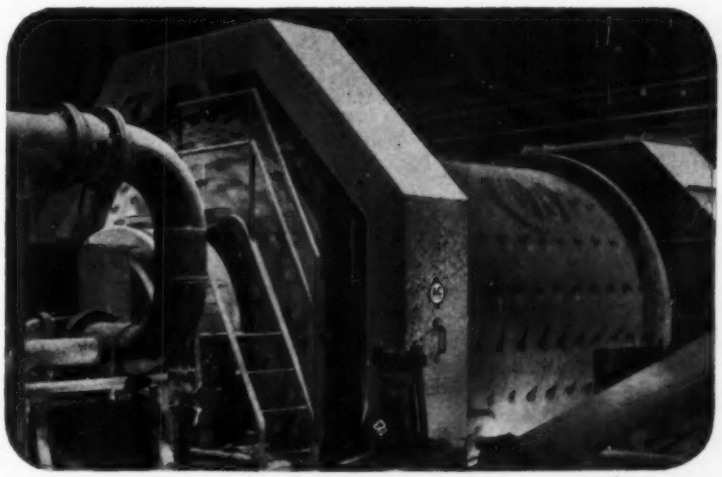
Floating start, ride and stop for big mills

New Lubritrol system provides constant lubrication for trunnion bearings

The new, bigger Allis-Chalmers mills now grinding out profits in progressive rock products plants actually *float on oil.* No bearing-wearing starts. Horsepower waste is kept at minimum. No dry sliding after shutdown. All functions of the *Lubritrol* system are automatic . . . controlled by foolproof pressure gages and switches. Filter removes contaminants.

When you modernize your rock products operation with a bigger mill, insist on Allis-Chalmers — the only mill that gives you the positive protection . . . the operating and maintenance economy of *Lubritrol* constant lubrication.

For complete information, see your A-C representative or write Allis-Chalmers, Industrial Equipment Division, Milwaukee 1, Wisconsin. In Canada, write Canadian Allis-Chalmers Ltd., Box 37, Montreal, Quebec.



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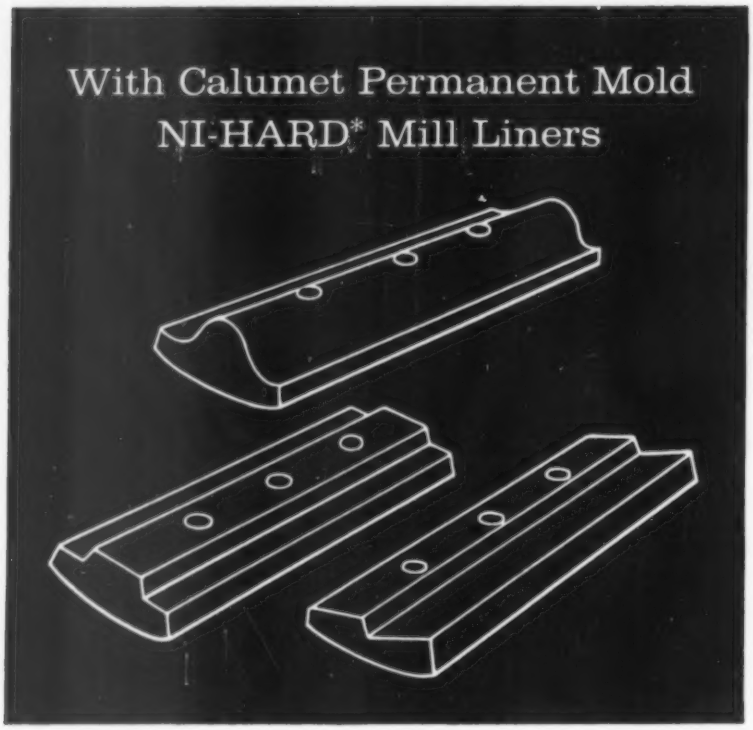
BEAT ABRASION

With Calumet Permanent Mold NI-HARD* Mill Liners



Are grinding mill costs getting you down?

If they are there's a sure-fire method available to offset the ravages of abrasion—your greatest enemy.

Next time costly wear forces you to reline a rod or ball mill, install Calumet Permanent Mold Ni-Hard liners.

Regardless of what material you are reducing or whether your operation is wet . . . or dry . . . you're going to reap the benefits of longer liner life brought about because of the greater strength, hardness and resistance to impact that Calumet builds into its liner segments.

In Calumet Permanent Mold Ni-Hard liners you obtain two great features — the resistance to abrasion inherent in the patented alloying of nickel and chrome elements plus Calumet's own years of foundry experience, its casting know-how and metallurgical skills.

Talk over your grinding problems with Calumet. You'll find that Calumet engineers can help you establish new concepts of efficiency and economy. Don't put it off . . . do it TODAY!

*Reg. U. S. Pat. Off., Int'l Nickel Co., Inc.

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Enter 30 on card, page 255

U. S. Bureau of Mines Cites Nonmetallic Mines For Long Safety Records

Two nonmetallic mines were among six winners in the largest National Safety Competition ever sponsored by the U. S. Bureau of Mines. The Grand Rapids mine, Bestwall Gypsum Company, Grand Rapids, Mich., operating 220,111 man-hours without a disabling injury, and Thornton quarry, Material Service Corporation, Thornton, Ill., operating 437,100 man-hours without a disabling injury, were the winners.

Bronze Sentinels of Safety trophies and green-and-white safety flags provided by the *Explosives Engineer* magazine were presented to the winners. A record total of 675 mineral operations in 44 states made the 1958 competition the most successful in history.

International Min. & Chem. Marks 50th Anniversary

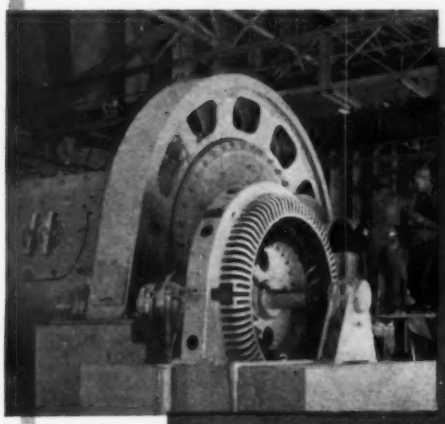
Plans have been outlined for the celebration of the first half-century of expansion and diversification of International Minerals and Chemical Corporation, which observed the 50th anniversary of its founding in June. A traveling display of historical pictures will be circulated to various IMC plant locations.

The firm was called International Agricultural Corporation when it was incorporated in New York in 1909. Its annual sales then were $5,000,000. Presently International Min. & Chem. is a nationwide corporation with 68 mines and plants, and annual sales in excess of $100 million.

A diversification program was begun which, in 1942, added Amino Products Division (maker of Ac'cent, the monosodium glutamate food flavor enhancer), and in 1951 the Industrial Minerals Division. This diversification sparked the name change in 1942.

Employees in two departments of the Huron Portland Cement Company mill at Alpena, Mich., were recently honored at a banquet for totalling nearly three million man-hours without a lost-time accident.

New insulation adds years to motor life



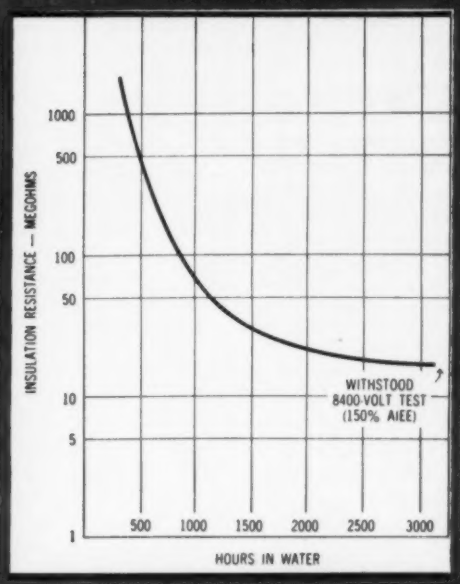


Chart shows insulation resistance in water of a 2300-volt *Silco-Flex* insulated coil, completely immersed with 2300 volts applied continuously.

Silco-Flex Insulation | **Polyester Mica Tape** | **Asphaltum Mica Tape**

Sandblasting proves the difference! Only *Silco-Flex* insulation stood up after one minute using 90-grit aluminum oxide and 100-psi air from distance of 6 inches.

Super-Seal motors withstand abrasion, physical stresses, moisture, heat aging

A drip-proof enclosure is usually all you need with the remarkable new insulating systems and advanced mechanical features of *Super-Seal* motors.

New motors are protected with the *Silco-Flex* stator coil insulating system: A homogeneous dielectric barrier of vulcanized silicone rubber possessing unmatched resistance to abrasives, moisture and most corrosive or chemical atmospheres.

Synchronous machines have *integrated* field coils that seal against contaminants . . . bond and lock against mechanical forces.

Contact your nearby A-C office or write Allis-Chalmers, Power Equipment Division, Milwaukee 1, Wisconsin.

Super-Seal and *Silco-Flex* are Allis-Chalmers trademarks.

A-C

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A-5922-CM

Social Security Accounts Need Regular Checks—Postcard Form Available

Future beneficiaries of social security accounts should check their account records at least once every three years, according to spokesmen of the Social Security Administration. The record of earnings kept by the administration form the basis on which eligibility and benefit amounts are determined. An error in the account might affect the amount of benefits received by the individual or his survivors.

Under the old-age, survivors, and disability insurance system, employers send in periodic reports to the government showing the wages paid to each employee. Self-employed persons report their own earnings as a part of their annual income tax return.

The Social Security Administration credits these earnings to the accounts of some 120,000,000 social security card holders. When a worker dies, retires, or becomes severely disabled, the earnings record reflects the length of employment or self-employment and the level of earnings on which eligibility and benefit amounts are figured.

Sometimes the earnings are not properly reported, or the social security account number is omitted or in error. When this happens, the social security bookkeepers cannot credit the earnings to the proper account until this has been adjusted.

Employees and self-employed people are therefore urged to check on their social security earnings account at least once every three years to assure themselves that the record is correct. The statute of limitations makes it more difficult to correct errors more than three years old. Any social security district office has a handy postcard form that can be used to request a statement of earnings.

A reprint of the special postcard form "Wage Statement Request" is reproduced herewith to aid those desiring a statement account. It should be cut out, pasted on a postal card, and mailed to your social security district office. Be sure to give your name and account number legibly and exactly as they are shown on your account number card. A separate form is required for each individual request. Sign your own name only.

Two California gypsum products plants of the Fibreboard Paper Products Corporation are being expanded. Capacity of the Newark, Calif., facility will be almost doubled with the completion of the project in August. The South Gate, Calif., plant capacity will be increased by 60 percent, and a new plaster mill is scheduled to be erected soon. A new 750,000,000-ton deposit of raw gypsum at Apex, Nev., will supply the plants.

This reproduction of the official Wage Statement Request form may be cut out and used according to instructions outlined in the accompanying article.

Form OAR-7004 (6-55)
Department of
HEALTH, EDUCATION, AND WELFARE

WAGE STATEMENT REQUEST

SOCIAL SECURITY ADMINISTRATION,
Bureau of Old-Age and Survivors Insurance,
Baltimore 2, Md.

ACCOUNT NUMBER

DATE OF BIRTH (Month) (Day) (Year)

Please send me a statement of amounts recorded in my Old-Age and Survivors Insurance Account.

Name { Miss / Mrs. / Mr. .....
Street and number .....
City, P. O. zone, and State .....
} Print or Type Name and Address Use Ink

Sign your name as usually written .....
(Do not print)

WARNING! Sign your own name only. Whoever falsely represents that he is the person whose name and account number appear above is subject to $1,000 fine or 1 year imprisonment or both.

If your name has been changed from that shown on your account number card, please copy your name below exactly as it appears on that card.

U. S. GOVERNMENT PRINTING OFFICE : 1958—O-468415

Legion of Safety Awards Given to 3 Firms by N.L.A. For Outstanding Records

The National Lime Association for the first time presented special 3,000-day and 2,000-day Legion of Safety certificates at its recent annual convention in Hot Springs, Va. The 3,000-day award went to the Spring-

National Lime Association
Legion of Safety
This Certificate is awarded to the
Springfield Plant
of
Ash Grove Lime & Portland Cement Co.
For having operated safely without a lost-time injury to any employee during a period of three thousand days or more from February 10, 1950. In commemoration of this achievement, the National Lime Association, cooperating with the United States Bureau of Mines, has awarded this Certificate of special honor.
LIME
General Manager
April 6, 1958
Washington D.C.

3,000-day safety certificate awarded by N.L.A. to the Ash Grove Lime & Portland Cement Co.

field, Mo., plant of Ash Grove Lime and Portland Cement Company, and the 2,000-day awards to the New Braunfels, Tex., plant of U. S. Gypsum Company and the Ludington, Mich., plant of Dow Chemical Company.

As of March 31, the Ash Grove plant had gone 3,336 days without a lost-time injury—the all-time record for the lime industry; and the Dow plant had 2,225 days. The U. S. Gypsum plant amassed 2,193 days up to last December.

A second kiln has been added to the facilities of the Caribbean Cement Company, Jamaica, B.W.I., boosting capacity of the plant to 1,200,000 bbl. per year. The 600,000-bbl. kiln was required when more than 1,000,000 bbl. of cement were consumed on Jamaica in 1958. The need for a third kiln is anticipated within a few years.

More than 1,500 acres of land in Amador County, Calif., have been purchased for American Cement Corporation. The land consists of large limestone deposits near Volcano, and clay desposits and possible plant sites near Ione.

Enter 33 on card, page 255 →

The right design, the right steel, the right shape make *ESCO* Points and Adapters right for every digging condition.

The construction industry looks to

ESCO®

Electric Steel Foundry Co., PORTLAND, OREGON

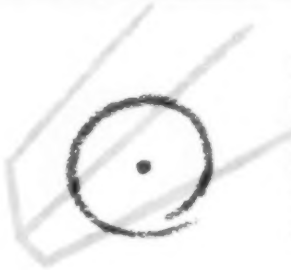
See reverse for shapes and size range >

Here are the points to remember...

12M ALLOY STEEL

ESCO 12M Points are the toughest you can buy. Developed through years of research for the construction industry, cast *ESCO* 12M is carefully heat treated to produce the finest steel made for the severe shock and abrasion encountered by points and adapters.

RIGID QUALITY CONTROL TESTS ASSURE TOUGHNESS, HARDNESS



Every *ESCO* Point is Brinell tested to assure the exact degree of shock-absorbing toughness and abrasion-resisting hardness for longer digging life. Be sure to look for the Brinell mark on every *ESCO* Point you buy.

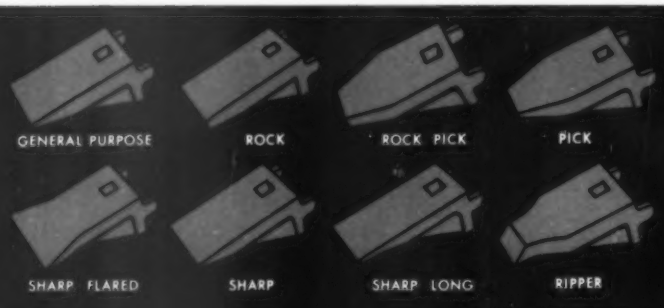
8 POINT SHAPES

You can select from eight different shapes to find the point that matches your digging conditions. *ESCO* Points are designed by bucket and excavation specialists who know how to achieve top digging performance. The self sharpening design of an *ESCO* Point makes it start sharp and stay sharp.

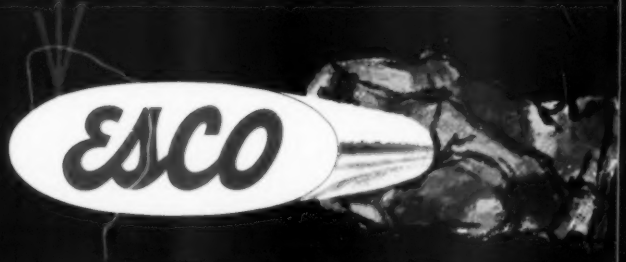
ESCO Points and Adapters for all digging equipment

Your local ESCO dealer can supply Points and Adapters for all your digging needs. By using ESCO Points and Adapters on all your equipment you can cut costs further by reducing your point inventory and consolidating purchases. Call your ESCO dealer today for details. He's listed in the yellow pages of your telephone directory. Or, write direct.

LITHO IN U.S.A.



ESCO Point shapes . . . start sharp, stay sharp and last longer under any digging condition.



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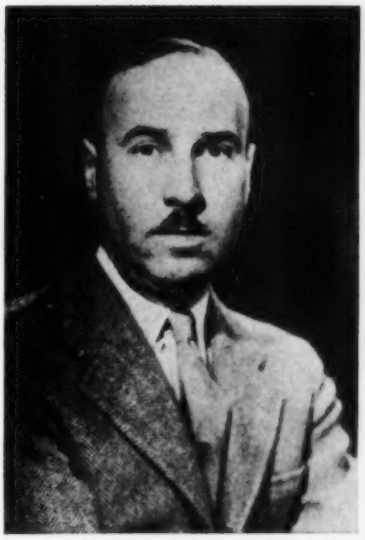
William W. Vicinus Appointed To N.C.L.I. Engineer Post

William W. Vicinus was recently appointed engineer for the National Crushed Limestone Institute. His headquarters will be in Washington, D. C.

Mr. Vicinus' background includes much diversification in mechanical and electrical as well as structural engineering. His career began with on-the-job experience with a New York construction firm, immediately followed by supervisory duties at a gypsum quarry in Michigan. He recently returned from an administrative appointment to the DEW line as sector superintendent.

Prior to this, he was with Vern E. Alden Company Engineers of Chicago, and became a resident engineer on a new explosives plant in southern Illinois. During this period, Mr. Vicinus also functioned in charge of labor management in the East St. Louis jurisdiction.

At one time he was employed as design and construction consultant for a number of American companies in Brazil.



W. W. Vicinus

March Lime Sales Increase In All Major Categories

Domestic sales of open-market lime in March (862,581 short tons) increased from the previous month's output, according to reports by producers to the U.S. Bureau of Mines.

Increases were noted in all major categories. (Note the accompanying table.)

Bestwall Gypsum Plans Addition As New Plant Nears Completion

A 16,000-sq. ft. addition will be added to the $7,000,000 gypsum board, lath, and plaster plant presently under construction at Brunswick, Ga., for Bestwall Gypsum Company, of Ardmore, Pa. The present construction was begun early in 1958 and is due for completion early in September.

The $500,000 extension will be used for the manufacture of a new product, gypsum acoustical ceiling tile. Originally the plant used about 300,000 tons of gypsum ore annually.

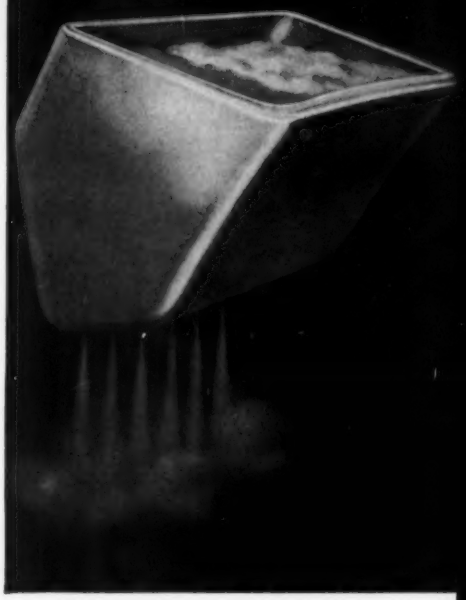
Lime Sold by Producers[1] in the United States, in Specified Periods of 1958-59, by Types and Major Uses in Short Tons

	1959	1959	1958	1959	1956
By types:					
Quicklime	575,161	689,397	445,805	1,834,481	1,365,805
Hydrated lime	138,332	173,184	154,411	444,176	410,491
Total	713,493	862,581	600,216	2,278,657	1,776,296
By uses:					
Agricultural:					
Quicklime	3,045	14,630	3,118	20,734	7,477
Hydrated lime	7,427	15,579	13,965	27,152	24,074
Total	10,472	30,209	17,083	47,886	31,551
Construction:					
Quicklime	10,494	12,367	10,530	34,340	28,092
Hydrated lime	58,797	76,278	69,785	191,608	189,297
Total	69,291	88,645	80,315	225,948	217,389
Chemical and other industrial:					
Quicklime	363,335	438,531	313,942	1,168,349	964,828
Hydrated lime	72,108	81,327	70,661	225,416	197,120
Total	435,443	519,858	384,603	1,393,765	1,161,948
Refractory (dead-burned dolomite)	198,287	223,869	118,215	611,058	365,408

[1] Also includes a small quantity of captive tonnage. The monthly canvass excludes the output of plants producing less than 10,000 tons a year.

Another PLUS value...

HOLES MAKE IT HOLD MORE



Here's the answer to increased bucket capacity in your elevators: *Rex Style AC Buckets.* Unique air ports in the bottom act as a relief valve for faster loading and unloading...prevent entrapped air from restricting capacity. Closer spacing of buckets assures increased over-all elevator capacity. Style AC buckets are ideal for handling of light, fluffy materials. For all the facts, see your Rex Distributor or mail the coupon.

REX®

ELEVATOR BUCKETS

CHAIN Belt Company 109
4604 W. Greenfield Ave.
Milwaukee 1, Wis.
(In Canada: CHAIN Belt Canada Ltd., 1181 Sheppard Ave. East, Toronto)

☐ Send me my copy of Bulletin 5766.
☐ Have a Rex man call.

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Address.....
City.....*Zone*.....*State*.....

Truck operators derive many worthwhile benefits through the use of Eaton 2-Speed Axles—ability to pull out under full load, quicker trips, safer operation, reduced driver fatigue, longer truck life, greater trade-in value.

But a big reason why more and more truckers in all fields of heavy duty hauling are specifying Eaton 2-Speed Axles is that this equipment effects important reductions in operating and maintenance costs—which is another way of saying: they add to profits!

Ask your truck dealer to show you how Eaton 2-Speed Axles can make big savings in your hauling operation.

EATON

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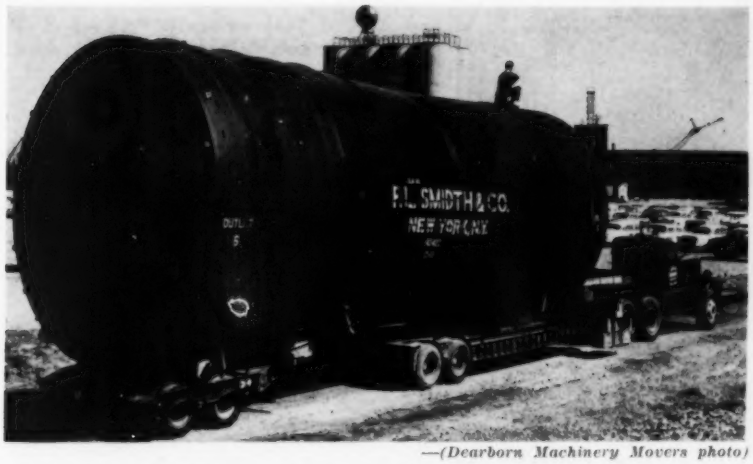
Eaton Axles in Trucks Today.

EATON AXLE DIVISION
MANUFACTURING COMPANY
CLEVELAND, OHIO

PRODUCTS: Engine Valves • Tappets • Hydraulic Valve Lifters • Valve Seat Inserts • Jet Engine Parts • Hydraulic Pumps Truck and Trailer Axles • Truck Transmissions • Permanent Mold Iron Castings • Automotive Heaters and Air Conditioners Fastening Devices • Cold Drawn Steel • Stampings • Forgings • Leaf and Coil Springs • Dynamatic Drives and Brakes Powdered Metal Parts • Gears • Variable Speed Drives • Speed Reducers • Differentials • Centralized Lubrication Systems



—(Dearborn Machinery Movers photo)

● The largest cement kilns ever made in the United States have been shipped to the Dundee Cement Company, Dundee, Mich. Pictured above is a kiln shell arriving at the plant site. The big kiln sections, manufactured for F. L. Smidth and Company by Chicago Bridge and Iron Company, were delivered by rail to Conneaut, Ohio, where they were loaded on board the Columbia Steamship Company's steamer, R. C. Norton, and shipped to Monroe, Mich. From Monroe, the sections were driven to the plant site by the Dearborn Machinery Movers.

10th Anniversary Observed By Perlite Institute— New Director Elected

Perlite Institute, an international trade association of perlite producers, recently observed its 10th anniversary. Marve Narramore, previously assistant secretary-treasurer of the Valve Manufacturers Association, has been named managing director. Mr. Narramore has had 12 years experience in trade association management and training. He replaces Richard J. O'Hair, who resigned from the position.

According to Perlite Institute figures, the industry has become a $15,000,000 business in the United States. In tonnage shipments of crude perlite ore and expanded perlite, the industry has increased to about 12 times its original volume in 10 years. For the last three years (1956-58) it has been the most popular plaster aggregate (its largest single use) in the United States, accounting for about 53 percent of all plaster applied in 1957 and 1958. Its other major use is in lightweight insulating concrete roof systems, floor fills, slab floors, and curtain wall backup systems.

Perlite Institute officially came into being on May 12, 1949. At that time perlite producers organized to solve collectively a number of problems facing this new industry.

Ten years of growth has seen the Perlite Institute develop into an international association and associate members in England, Germany, Greece, Japan, Australia, New Zealand, Mexico, and Cuba. Its U. S. and Canadian members include perlite expanders and miners and four associate members, who are manufacturers of perlite expanding furnaces and multiwall bags.

Marve Narramore

Two new directors were recently elected to the board of the Perlite Institute. They are Jesse L. Maury, Atlantic Perlite Company, Washington, D. C., and B. S. Howell Jr., Tennessee Products and Chemical Corporation, Nashville. Neal Snyder of Combined Metals Reduction Company, Salt Lake City, was re-elected to the board. All directors serve two-year terms.

Another PLUS value...

Stops
HOLDUPS
in your production

Want continuous production...to cut installation costs? Investigate the advantages of Rex Segmental Rim Sprockets and Traction Wheels. Tough, long-lasting special cast steel rims bolt simply to either split or solid hub body. When, after long service life, replacement is required, all you do is replace the worn rim...the hub body remains on the shaft. See your Rex Distributor or mail the coupon.

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Company.....
Address.....
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Serving industry with steels that fit the job

GET TOUGH

WITH LUKENS "T-1" STEEL

TRADEMARK

Where the going gets rough, versatile Lukens "T-1" steel fights back. For repair or modification of heavy duty equipment such as truck beds, chutes, bucket teeth and dozer blades, this special duty steel plate can be ordered from *warehouse stock* in a wide range of plate sizes and gages. Lukens "T-1" is the modern mining steel—you can work and weld it in the field as readily as in your shop. Its terrific resistance to abrasive impact—coupled with an extremely high yield strength—means fewer replacements and often greater payloads. That's why more and more equipment builders are using Lukens "T-1" to provide longer life in shovel buckets, trucks and other mining equipment. Remember to specify the extra-tough 321 min. BHN quality. For performance and application details, request our special booklet, "Lukens 'T-1' for Toughness." Address Manager, Application Engineering Dept., 079 Services Bldg., Lukens Steel Company, Coatesville, Pennsylvania.

These warehouses can supply you with Lukens "T-1" steel plate...

Alabama, BIRMINGHAM 2, O'Neal Steel, Inc., P.O. Box 2623 • **California,** LOS ANGELES 54, Earle M. Jorgensen Co., P.O. Box 2358, Terminal Annex, 10650 S. Alameda St. • LOS ANGELES 33, The R. J. M. Company, 238-248 South Mission Rd. • **Illinois,** CHICAGO 8, Joseph T. Ryerson & Son, Inc., 16th and Rockwell Sts. • **Kentucky,** ASHLAND, Mansbach Steel Co., 19th St. and River Front • **Maryland,** BALTIMORE 2, Wm. G. Wetherall, Inc. 317 President St. • **New Mexico,** ALBUQUERQUE, Miller and Smith Mfg. Co., Inc., 500 Phoenix Ave., N. W. • **Ohio,** CLEVELAND 6, Mills-Wolf Steel Co., 12434 Cedar Rd. • **Oregon,** PORTLAND 4, J. E. Haseltine & Co., 115 S. W. Second Ave. • **Pennsylvania,** McKEES ROCKS, Follansbee Metals Division, 200 Bradley St. • **Quebec,** MONTREAL, Drummond, McCall & Co., Ltd., 930 Wellington St. • **Utah,** SALT LAKE CITY, Structural Steel & Forge Co., P.O. Box 300 • **Washington,** SEATTLE 4, Stack Steel & Supply Co., 500 Landers St. • SPOKANE 10, Union Iron Works, East 217 Montgomery Ave., P.O. Box 2135.

LUKENS (R)

J. F. Callery of Lone Star Dies After 32-Year Career

James F. Callery, publicity manager of the Lone Star Cement Corporation, died unexpectedly on June 10, at the age of 63. A native of New York City, Mr. Callery had been associated with Lone Star for 32 years in sales, management, and public relations capacities in this country and South America.

He served Lone Star as a salesman at Charlotte, N. C., Norfolk and Roanoke, Va., and as district sales manager at Washington, D. C. In 1934 he was assigned as sales manager of Lone Star's Brazilian subsidiary, Companhia Nacional de Cimento Portland, Rio de Janeiro. Mr. Callery was later assistant manager of Brazilian operations, and vice-president and manager of Compania Uruguay de Cemento Portland, Montevideo, Uruguay.

J. F. Callery

In 1946, Mr. Callery returned to New York to guide Lone Star's advertising and public relations program.

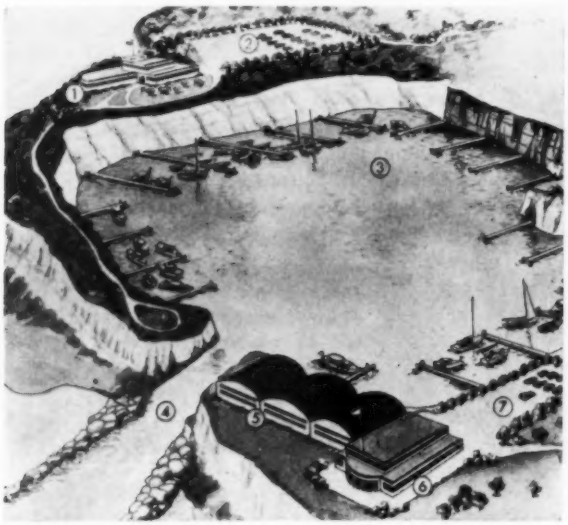
N. Y. Trap Rock Co. Quarry To Become River Harbor

Officials of the New York Trap Rock Corporation have announced plans for a marina or harbor, to be located at Verplanck, N. Y., the site of a former quarry operation. When it is filled with water, the quarry will provide a sheltered anchorage to serve approximately 300 private vessels from metropolitan New York-New Jersey-Connecticut waters.

Floating finger piers will be placed around the perimeter of the marina waters, and a tender service will carry the owners to and from their boats. The club and restaurant and lounge will be located on Indian Point promontory, which affords a panoramic view of the Hudson River.

Winter storage and repair facilities are also included in the master plans. The marina will serve as a winter storage area for the New York Trap Rock barge fleet.

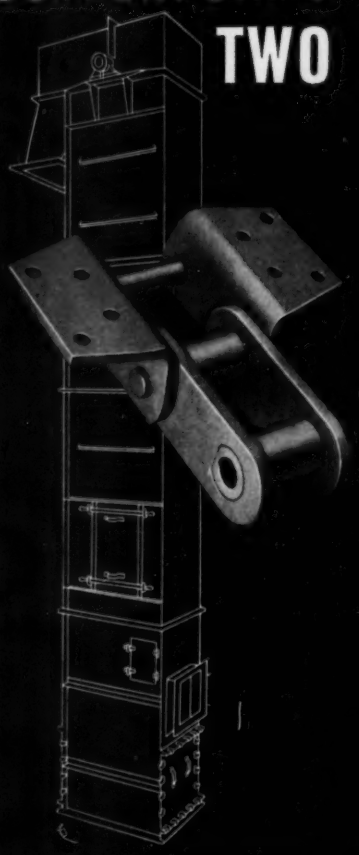
Construction will entail cutting a channel between the Hudson River and the waters of the quarry. This passage will have a bottom width of 50 ft. and a water depth at mean low water of 17 ft.



A sketch of the proposed marina. Included in the master plans are: 1) a modern restaurant and lounge; 2) parking facilities; 3) the marina basin surrounded by floating finger piers for approximately 300 boats; 4) channel flanked by protective groins; 5) buildings to house craft for storage or repairs; 6) main boat club; and 7) additional parking facilities.

Another PLUS value...

THIS ONE OUTPERFORMS TWO



It's proved in actual performance...in many applications a single strand of Rex Chabelco Steel Elevator Chain is being used to replace double strands of ordinary chains. Here's why:

• *Largest working bearing areas for long life* • *Accurate size control and fits for maximum fatigue resistance* • *Precision-made chain parts for smooth sprocket action...less wear on chain and sprockets.*

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Screen COARSE SLAG with a 2-bearing screen?

"Yes" says

KENNETH KAGARISE
General Superintendent
STANDARD SLAG COMPANY

"Frankly, we were skeptical of the ability of a 2-bearing screen to stand up to the man-sized job of screening coarse slag without flattening out. Some months after having 2 SECO TWIN BEARING Screens installed at our Weirton, W. Va. plant, we were so pleased with their operation, we had additional screens installed at our Sparrows Point, Md. plant. All are screening coarse slag and we have experienced very satisfactory results."

Mr. Operator: You owe it to yourself to find out how the stout-hearted performance of SECO TWIN BEARING Screens can help you to realize more profits through accurate, consistent screening year in and year out.

Made Only by

SCREEN EQUIPMENT CO., Inc.
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Here's the whole story on SECO TWIN BEARING Screens. 8 pages of facts and illustrations that will show you why SECO TWIN BEARING Screens are your one best choice for accurate results, longer life and dependable performance.

SECO
TWIN BEARING
SCREENS

Industry Personalities

W. Ostberg

WERNER OSTBERG has been appointed plant manager of the Dundee Cement Company, Dundee, Mich. Before joining Dundee last year, Mr. Ostberg had been plant manager of the Alexandria Portland Cement Company in Egypt. Earlier he was a project and field engineer, working on several cement projects throughout the world for F. L. Smidth & Company, engineers and manufacturers of cement machinery.

Mr. Ostberg was born and educated in Denmark. He is a graduate of Odense-Maskinbygnings Technikum in mechanical engineering.

H. F. Stepanek

HAROLD F. STEPANEK has been named secretary - treasurer for Alpha Portland Cement Company. He succeeds KARL T. WRIGHT, who retired recently after 49 years with the firm. Mr. Stepanek joined Alpha in 1952, and in 1955 he became a company officer when he was elected assistant secretary-assistant treasurer.

This position will now be filled by EDGAR R. FACKENTHAL. Mr. Fackenthal, who has been affiliated with Alpha since 1924, was appointed assistant to the treasurer in 1958.

D. BEDELL BAXTER has been appointed to the newly-created post of assistant to the vice-president, service engineering, for Basic Incorporated, with headquarters in Cleveland. He was in the company's refractory sales division for 19 years previously.

DAVID E. HOLMGREN has been appointed Basic Incorporated sales development engineer. Located in the Cleveland office, he will work on a variety of refractory problems.

THOMAS P. STANTON will be in charge of a new Eastern sales district which has been formed for the Atlantic coast region, with headquarters in Philadelphia. He is presently district sales manager, with offices at Basic's Hammond, Ind., plant.

GEORGE J. PEER will become Midwestern district sales manager, with headquarters in Hammond.

T. F. Harbottle

CAPTAIN THOMAS F. HARBOTTLE was recently appointed marine superintendent of Pittsburgh Steamship Division, an affiliate of the U. S. Steel Corporation. Captain Harbottle succeeds CAPTAIN DANA T. WHITLOCK, who has retired after 46 years of service.

Captain Harbottle will be responsible for all navigational safety and communications, vessel personnel, and performance.

JOHN W. ROBERTS, president of Southern Lightweight Aggregate Corporation, Richmond, Va., has been given the additional duties of treasurer of the company.

A. CABELL FORD, director of sales, was appointed secretary of the company, and EVERETT S. GRAY was named assistant secretary.

Besides serving as president of Southern Lightweight, Mr. Roberts also heads the subsidiary group of Solite companies operating in North Carolina, Florida, and Virginia. He is past-president of the Richmond Builders Exchange, Virginia Ready-Mixed Concrete Association, and the National Ready-Mixed Concrete Association and a director of several organizations.

Another PLUS value..

SEALS IN LONGER LIFE

When you choose a Shafer Bearing, you may be sure it has the *right* seal for *longest life* in your *specific* application.

Whatever the operating condition—whether it's fine abrasive dust from vibrating screens or caustic solutions from industrial washers—the *right* Shafer self-aligning seal is available to assure full bearing protection. Shafer has the industry's largest selection. Call your distributor or mail the coupon.

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SELF-ALIGNING
ROLLER BEARINGS

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City.....*Zone*.....*State*.....

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Changing old ideas on earth moving...

The JOHN DEERE "840" with Hancock "Piggyback" Scraper

"It takes heavy investment to get an efficient scraper of effective size."

"You need a stand-by pusher to get those heaped payloads."

"You have to sacrifice high maneuverability if you're going to get a scraper that really produces for you."

These old ideas are fading fast in the face of the performance of this John Deere-Hancock outfit.

First, compare the initial cost with other scrapers. See for yourself what you save in dollar outlay, keeping in mind you don't need a pusher tractor to give you a *fully loaded (7-1/2-yard) bowl every time.*

Then, consider the added working efficiency you get with the John Deere-Hancock unit which makes a complete, *continuous turn within a 30-foot diameter.*

Finally, you get that outstanding feature you are sure to want—*positive, hydraulic ejection*—which means a fast, easy dump in all soils.

For a demonstration, see your John Deere Industrial Dealer.

For detailed specifications, write today.

Immediate ownership through the John Deere Credit Plan

Just a reasonable amount down, and you can paint your name on the side of any John Deere Industrial Unit—put it to work earning the monthly or seasonal payments agreed on. All arrangements are made with the dealer in strict confidence.

John Deere
Industrial Division
Dept. 559, Moline, Illinois

JOHN DEERE *"Specialists in Low-Cost Power with a Heavyweight Punch"*

ROBERT R. ROSS has been appointed manager of the Hillsville plant of U. S. Steel's Michigan Limestone Division. He succeeds J. WALTER BAIRD, who recently retired after 43 years of service with U. S. Steel.

W. CARL BENTON has been named manager of the Moler plant of Michigan Limestone Division, the post formerly held by Mr. Ross.

E. F. Brownstead

ERNEST F. BROWNSTEAD, vice-president of operations, Alpha Portland Cement Company, was recently elected a director of the company. His appointment fills the board vacancy caused by the death of Vermont Hatch. Mr. Brownstead has been with Alpha since 1921, and was named vice-president in 1958.

H. EUGENE BROWN has been named vice-president in charge of Alpha's midwestern sales division, at St. Louis, Mo. He had been manager of the southern sales division since 1956.

HARRIS N. SNYDER, a leading industrialist and community leader, was named Niagara Frontier's "Businessman of the Year" by the University of Buffalo School of Business Alumni Association at its recent annual dinner.

Mr. Snyder, president and treasurer of the Buffalo Slag Company, was one of the founders of the Federal Portland Cement Company. He later became president of the Federal Crushed Stone Corporation and served as president of the Hornell Gravel Corporation, which later was merged with the Buffalo Slag Company.

HAROLD E. TIBBS. has been named quality superintendent of the Fort Dodge, Iowa, plant of the United States Gypsum Company. Mr. Tibbs joined U. S. Gypsum in 1950 as quarry engineer. He was quality and mill superintendent at the Heath, Mont., plant prior to his recent appointment.

ROBERT D. BRADFORD and EDWARD McL. TITTMANN were recently elected executive vice-presidents of American Smelting and Refining Company, and CHARLES F. BARBER and FORREST G. HAMRICK were elected vice-presidents. Mr. Barber was also elected a director of the firm.

Mr. Bradford has been a vice-president since 1952 and a director since 1957. He is president of Lake Asbestos of Quebec, Ltd., Asarco's wholly owned asbestos producing subsidiary.

Mr. Tittmann joined Asarco in 1929. In December of 1958 he became vice-president in charge of smelting and refining operations, and is president of Asarco's subsidiary, Southern Peru Copper Corporation.

Mr. Barber came to Asarco in 1956 as general counsel, leaving his post as assistant to the Solicitor General of the United States.

Mr. Hamrick joined Asarco in 1946 as a financial and economic analyst. In 1957 he was elected treasurer and director.

M. De Shazo Jr.

MANON DE SHAZO JR. has been named southern sales manager for the Alpha Portland Cement Company, Easton, Pa. He has been a salesman in the firm's Birmingham sales district since 1949. Headquarters will be in Birmingham, Ala. Mr. DeShazo succeeds H. E. Brown, who was recently elected vice-president in charge of Alpha's mid-western sales divison.

Mr. DeShazo originally joined Alpha in 1945.

ROBERT B. HORNER has been named president of Kosmos Portland Cement Company, Kosmosdale, Ky. He succeeds his father, CHARLES HORNER, who has been named vice-chairman of the board.

Before his appointment as president, Mr. Horner was vice-president in charge of operations. He joined the firm in 1946 as an assistant engineer and later became assistant plant manager and finally plant manager.

Enter 43 on card, page 255 →

Another PLUS value...

BUILT TO TAKE

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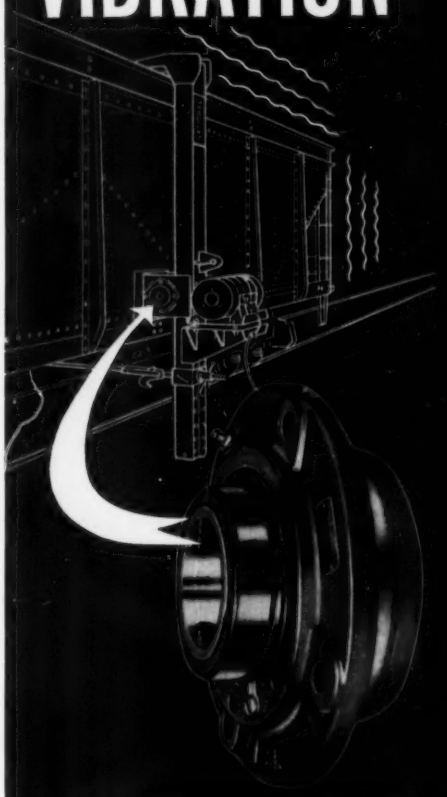

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This reserve stamina stems from exclusive bearing design and precision construction. Concave rollers matched to convex raceways are of highly elastic, case-hardened alloy steel. With every shock, rollers compress, increasing bearing surfaces.

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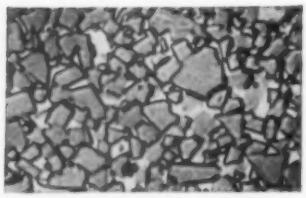
Longer bit life— with *new* Sandvik Coromant Bits



Sandvik Coromant Tungsten Carbide (Microphoto) Uniformity of size, even distribution of grain are marked. Free from porosity and impurities —therefore stronger, longer-lived.

Low quality Tungsten Carbide (Microphoto) Black marks are contaminations caused by deficient production control. They weaken the carbide, reduce its working life.

NEXT time you buy bits, specify Sandvik Coromant because they give more footage per bit, lower drilling costs. Here's why:

1 Only first-quality tungsten carbide is used —as shown in the microphotos above. This means less wear, longer life and a better job.

2 The bodies are precision-made of high quality alloy steel—tough enough to take the strain throughout the extra-long bit life.

3 The bigger Sandvik Coromant bits are all of X-design, which prevents rifling. No wonder Sandvik Coromant inserts are the most widely used in the world, drilling more than one billion feet every year.

SANDVIK COROMANT bits are supplied through Atlas Copco, the world's largest manufacturer of rock drills, who also supply Sandvik Coromant integral steels — the most widely used in the world — and Sandvik Coromant extension steel equipment.

Sandvik Coromant Detachable Bits are Available in the following Thread Sizes and Bit Diameters

Available Diameters, in Inches

Type	Thread	1¼	1⅜	1½	1⅝	1¾	1⅞	2	2⅛	2¼	2⅜	2½	2⅝	3	3½	4	4½	5
SHOULDER	TAPER	x	x	x	x													
	F		x	x														
	113		x															
	H			x	x	x	x	x		x								
	115			x	x													
	D						x	x	x	x	x	x	x	x				
	K													x	x	x	x	
BOTTOMING	1" Rope				x	x	x	x		x				x				
	1¼" Rope						x	x	x	x		x		x				
	400						x	x		x		x						
	1½" Rope											x	x	x	x	x		
	600											x	x	x	x			
	700													x	x			
	J7.5															x	x	
	2" Rope														x	x	x	x
	1000																x	

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ROBERT H. BIGGS has been named plant manager of Ideal Cement Company's new $12,000,000 plant at Tijeras, N. M. Mr. Biggs has been with Ideal Cement since 1953, serving in engineering capacities at various of the firm's plants. He was project manager during the construction of the plant.

ROWLAND C. POLLARD has been appointed sales manager for the New Mexico division of Ideal. He joined the firm in 1943, and was named assistant sales manager for the area in 1945. His headquarters will be in Albuquerque, N. M.

JOHN E. DAVIDSON was recently elected a vice-president of The Arundel Corporation by the board of directors. He was also named a director to fill the vacancy on the board caused by the recent death of S. Bonsal Brooks. Mr. Davidson has been associated with the construction and dredging industry for more than 30 years. In January of this year he became assistant to the president of Arundel, and will also continue in that capacity.

RAY M. LOHR has been elected secretary and controller of the Bessemer Limestone and Cement Company, Youngstown, Ohio. ROBERT L. ROSENBERGER has become treasurer of the firm.

JOHN Q. ADAMS, formerly vice-president, secretary, and treasurer, has retired after 41 years of service. He will continue to serve as a director of the company.

CECIL F. ROUSE has been appointed merchandise manager at the Oakland, Calif., office of Pacific Cement and Aggregates, Incorporated. VIRGIL E. OWEN was named district manager of the East Bay territory.

CLAY LAMBERT has been named vice-president in charge of operations for the Consumers Company Division, Vulcan Materials Company. Also promoted were DONALD B. WENDLING, who was named vice-president in charge of sales; WILLIAM C. SCHLEGEL, named vice-president in charge of concrete sales; and ROBERT E. WEYLAND, newly appointed vice-president and general manager of the Wisconsin Division.

Obituaries

FORREST A. THOMAS, L. & W. Construction Company, Russell, Iowa, was fatally injured in an automobile accident on June 4, near West Liberty, Iowa. He was on his way to attend a directors' meeting of the Iowa Limestone Producers Association in Des Moines. Mrs. Thomas, who had accompanied him on the trip, was injured.

CLARENCE M. NEILER, a retired assistant secretary and assistant treasurer of the General Refractories Company, died recently. Mr. Neiler had been associated with the firm for 35 years before his retirement in 1948.

GEORGE E. PIERSON, former executive of Lone Star Cement Company, Indiana Division, Indianapolis, died recently in that city. He joined Lone Star in 1924 and served as vice-president from 1930 until 1948. He was a consultant for the firm until he retired a year later.

D. LIST WARNER, former president of the Thomasville Stone and Lime Company, York, Pa., recently passed away after a brief illness. Mr. Warner became president of the firm in 1930 and retired in 1957.

JEPTHA CLEVELAND MCKEE, president of McKee Quarries, Incorporated, Archie, Mo., died recently in a local hospital. He had been ill for a year.

FORD J. TWAITS, former president of Consolidated Rock Products Company, Los Angeles, Calif., died recently. Mr. Twaits was a partner-founder of Twaits, Wittenberg Company, a Los Angeles construction-engineering firm.

W. LEONARD RAMSAY, retired assistant secretary-treasurer of the Stewart Sand and Material Company, Kansas City, Kans., died recently. He had been associated with the firm for 40 years.

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You quickly find the one best idler for your specific service requirements when you specify Rex. For two reasons: 1) Rex offers you the industry's most complete line; 2) each Rex Idler is accurately rated for specific applications in each of four basic service groups—moderate, standard, heavy, and super-service lines. This assures easy selection, longest life, minimum maintenance and lowest possible unit cost in your installation. See your Rex Distributor or mail the coupon today.

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W. L. Bryan (Bryan Rock Products, Inc., Shakopee, Minn.), N.A.L.I. board chairman, flanked by Robert M. Koch, left, president of the Institute; and Thomas B. Stafford, right (Vermarco Lime Co., West Rutland, Vt.), a regional vice-president.

By BUREN C. HEROD

Proposal for New Corporation Approved by N.A.L.I. Board

ONE of the most significant mid-year board meetings in the experience of the National Agricultural Limestone Institute was held by its directors on June 8-9 at the Sheraton-Blackstone Hotel in Chicago.

During the two-day session, which was attended by 53 men—more than two-thirds of the board—a substantial majority approved a proposal developed jointly by committees representing N.A.L.I. and the National Crushed Limestone Institute. This proposal recommended that the two groups be merged into a single corporate structure to be incorporated as the National Limestone Institute. This proposal, as approved by the majority of the board, has been presented in the membership for their voting by mail ballot.

Preceding the general session, the executive committee met to consider the reports of the standing committees and of the special group set up to study the feasibility of the merger. The former dealt with N.A.L.I. interests in legislation, public relations, taxes, promotion and education, and internal business of the Institute.

W. L. Bryan (Bryan Rock Products, Inc., Shakopee, Minn.) chairman of the board of N.A.L.I., presided over the general board meeting, during which all committee reports were reviewed. That of the merger study group was given priority.

In the merger proposal, developed on the basis that the interests of members of both the agricultural limestone and crushed limestone groups could be more efficiently served through one organization, it was recommended that the latter be named and incorporated as the National Limestone Institute. However, the committee recognized that all member companies of the present separate corporations do not have an interest in all activities of the two groups, and therefore would not care to subscribe to all programs of the new organization.

Therefore, the formation of two divisions was suggested—an agricultural limestone division and a crushed limestone division. Each division would have a separate board of directors, and a separate budget, but there would be one group of executive officers and one executive committee. It was further suggested that the prestige of N.L.I. as a whole would back any policy or proposal initiated by either division.

The merger proposal as a majority report was accompanied by a minority report, which indicated the wish of the minority that the N.A.L.I. and N.C.L.I. be continued as separate corporations and follow the same day-to-day operational procedures and annual convention arrangements as in the past.

In his report on the overall interests of the Institute, Robert M. Koch, president of N.A.L.I. noted that he is confident the present level of ACP appropriations will at least be continued, and that in view of known results throughout the country it might well be increased in the near future.

A major factor contributing to this optimism is the fact that certain controversies and attendant publicity in recent months have thrown a spotlight on the conservation scene, making the picture much more clear for many congressmen who were actually misinformed as to the actual benefits obtained from various conservation programs.

The uncomplimentary publicity from some quarters has thus actually been a service, Mr. Koch noted. Resultant investigations have shown that the ACP, which this group backs solidly, has provided more actual conservation *on the land* than some other programs in which a much larger proportion of appropriations are absorbed in salaries alone. It was also pointed out that there is growing "grass roots" support from farmer

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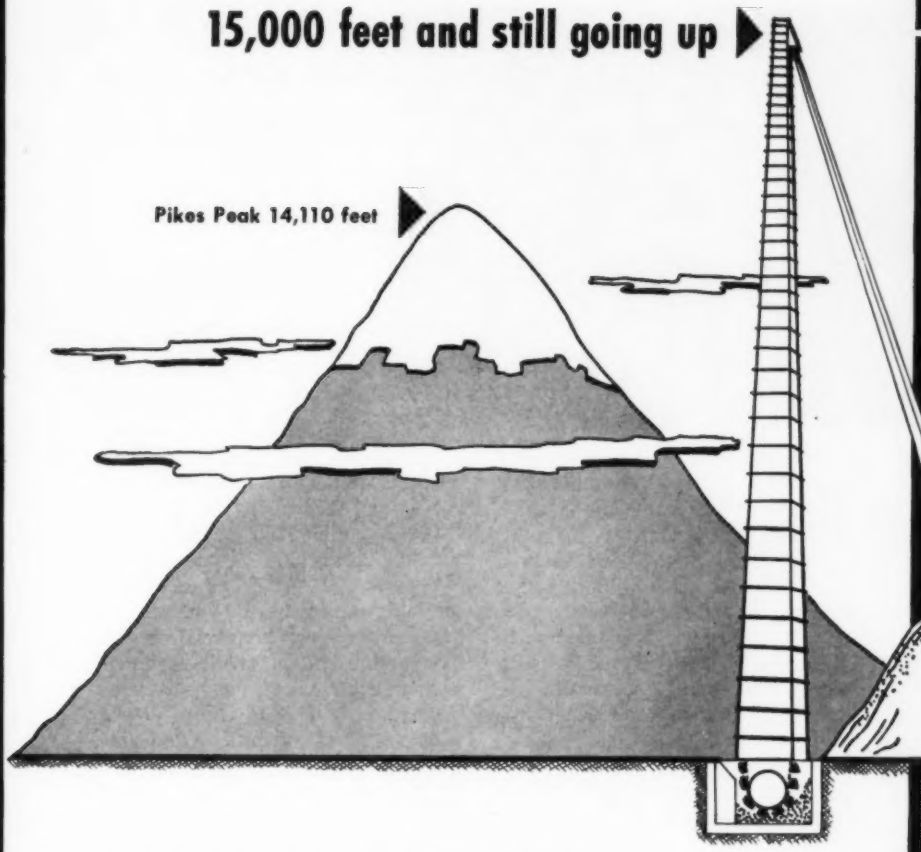

REX CEMENT MILL BUCKET ELEVATORS

Higher than Pikes Peak... that's the total footage of Rex Cement Mill Elevators which have been installed in the past five years. Here's proof of the cost-saving, profit-adding advantages of this advanced concept in elevator design.

Five years ago CHAIN Belt introduced this completely new idea in cement mill elevators... a concept based on the needs of modern cement mill operations. It was radical... the first really new idea in bucket elevators in 20 years. Each component was individually designed and balanced with the strength of the others. The results: increased capacity... longer life... freedom from premature breakdowns... economy.

Today more than 15,000 feet of these new elevators are working in cement mills all over the world... and the total increases daily. The new concept is so sound... so basically right... it has become a standard that others are still seeking to reach. For complete data on Rex Cement Mill Bucket Elevators or Elevator Components, write for Bulletin No. 3304. CHAIN Belt Company, 4604 W. Greenfield Ave., Milwaukee 1, Wis. In Canada: CHAIN Belt (Canada) Ltd., 1181 Sheppard Ave. East, Toronto.

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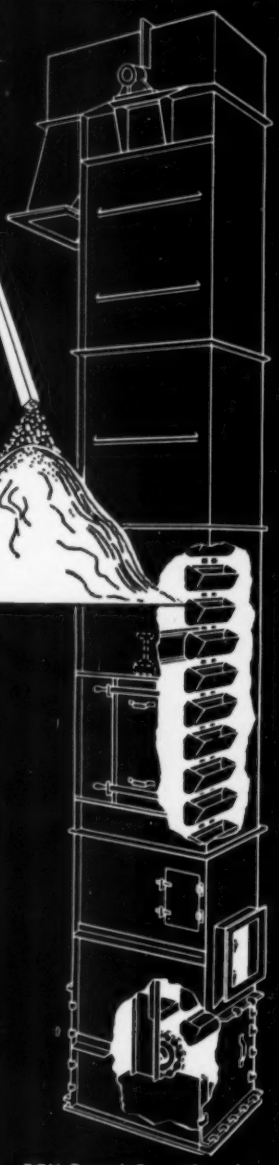
CEMENT MILL
BUCKET ELEVATORS



REX Rated Centrifugal
Discharge Bucket Elevator

Bulletin
No. 3304
gives you complete information on Rex Cement Mill Bucket Elevators—includes tables for fast, easy selection.

Among the executive committee members present were (l. to r.): Robert M. Koch, president; W. L. Bryan (Bryan Rock Products, Inc.), chairman of the board; Russell W. Hunt (Southwest Lime Co.); Robert M. Bridges (Consumers Company Division, Vulcan Materials); W. J. Clark (Munnsville Limestone Corporation); A. W. Mulzer (Mulzer Brothers); William E. Stone (Piqua, Ohio); E. B. Snead (Texas Crushed Stone Co.); J. B. Mount (Maymead Lime Co.), secretary-treasurer; Arthur R. Alvis (Alvis Limestone & Concrete Products, Inc.), vice-chairman of the board; and Powell G. Potts (Franklin, Ky.). Members R. O. Bemis (Basic Dolomite), and George A. Ziegler (M. J. Grove Lime Co.) were not available for this photo.

groups, as well as conservation field men, for the ACP practices backed by the N.A.L.I.

William J. Clark (Munnsville Limestone Corp., Munnsville, N. Y.) reported for the convention arrangements committee. In consideration of the possible merger, the committee made certain recommendations concerning simultaneous meetings of the two divisions during the 1960 annual convention, which will be held from January 17 to 20 at the Hotel Statler, Washington, D. C. Other sessions during that meeting have been scheduled for joint attendance. The committee also recommended that the dates for the 1961 annual convention be scheduled to coincide with the national presidential inauguration. Next year's mid-year board meeting has been set up on June 6 and 7, again at the Sheraton-Blackstone Hotel in Chicago.

In view of the results obtained by the Washington staff in field trips directed toward obtaining new members, the membership committee recommended continuation of these efforts. Since the first of the year, it was noted, 11 new members have made application and have been approved. This brings the total membership to a new high of 455 active members and 87 associate members.

George A. Ziegler (M. J. Grove Lime Co., Lime Kiln, Md.) reported for the promotion and education committee. He reviewed the distribution during the last 18 months of the Institute's news releases. It was recommended that members intensify distribution of these items to such groups as 4-H clubs, Vo-Ag teachers, ASC committees, and similar organizations.

Chairman Powell G. Potts (Franklin, Ky.) reported for the legislative, public relations, and tax committee, which recommended strongly that the membership utilize all means available to acquaint the general public with the value of liming. It was also suggested that a closer liaison with the fertilizer industry would be of mutual benefit, as well as a means of attaining the prime objective--putting the nation's soils in top condition.

Ideal Cement-Union Agreement Sets 20¢-Hr. Wage Increase

The recent wage agreement between Ideal Cement Company and the United Cement, Lime and Gypsum Workers union may establish a pattern for settlement of other contracts, spokesmen for several major cement companies indicated. The Ideal grant amounts to pay increases of 20 cents an hour to its employees over a two-year period.

Terms of the agreement specify an increase of 10 cents an hour retroactive to May 1, and an additional increase of 10 cents per hour on May 1, 1960. A supplementary unemployment benefit fund will also be started by Ideal, with a contribution of 3 cents an hour for each employee. Ideal employs 2,000 workers in 16 plants.

Controlling Interest Sold In Fond du Lac Stone Co.

Controlling interest in the Fond du Lac Stone Company, Fond du Lac, Wis., has been purchased by Elmer E. Homuth and Milton H. Homuth, who have become vice-president and treasurer respectively. A. A. Behnke, who will continue as president, and Haakon Erickson, secretary, continue to hold substantial stock interest in the company. Fond du Lac Stone Company was founded 30 years ago.

Engineering has begun for new gypsum plants to be built by National Gypsum Company in California and in Canada. These plants will be in addition to the gypsum mill presently under construction at Lorain, Ohio. Several existing plants will also be modified and enlarged to increase production.

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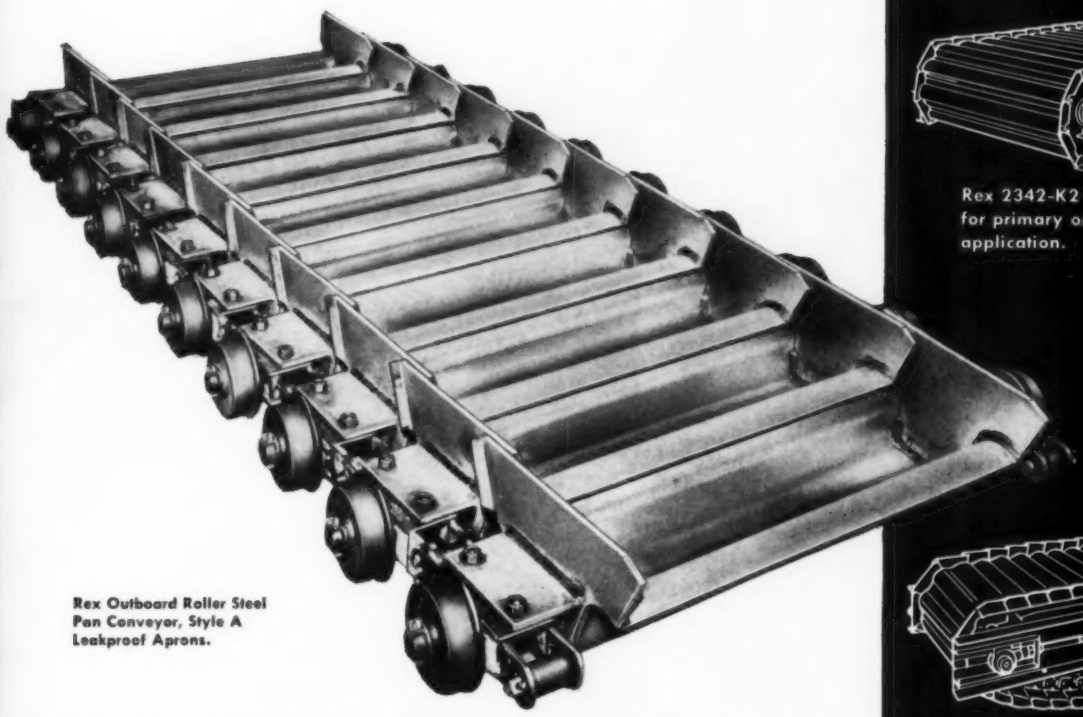
Another PLUS value...

How to convey hot bulk materials with initial temperatures up to 1900°



Rex Outboard Roller Steel Pan Conveyor, Style A Leakproof Aprons.

Rex Outboard Roller Steel Pan Conveyors provide a practical solution to many unusual conveyor problems.

Unique construction assures longer life—eliminates many replacement costs down through the years—holds down time and maintenance costs to a minimum.

Here are two of the ways improved Rex design gets right to the heart of the heat problem:

1. Chain and rollers are insulated from maximum temperature heat zone.
2. Carbon steel pans, with large pan surfaces, provide maximum heat transfer.

Long wear life, easy maintenance—Ruggedly built for extra stamina, Rex Outboard Roller Steel Pan Conveyors are known for their long, trouble-free service. Wear is confined to heavy outboard rollers; square through rods connecting the chains assure rigidity, equal load distribution; and outboard roller design permits easy servicing without disassembly of chain or conveyor.

Preferred throughout industry—Deep pan construction, shown above, is ideally suited for use in a wide range of heat processing applications; for example: calcining, sintering, briquetting, beneficiating and nodulizing. This style is available in a wide range of sizes.

Other types available for every service—For information on how Rex Apron Feeders, Apron and Pan Conveyors can help you cut production costs, write CHAIN Belt Company, 4604 W. Greenfield Ave., Milwaukee 1, Wis. In Canada: CHAIN Belt (Canada) Ltd., 1181 Sheppard Ave. East, Toronto.

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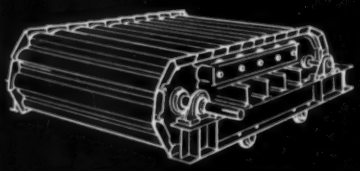
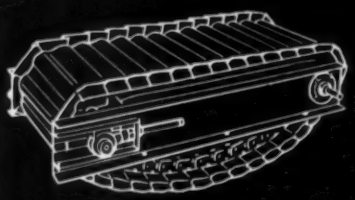
OUTBOARD ROLLER
STEEL PAN CONVEYOR

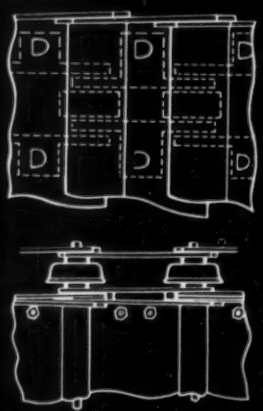
Types For EVERY Service



Rex 2342-K21 Heavy-Duty Feeder for primary or secondary application.



Rex 531-K17 Light-Duty Apron Feeder, used under hoppers and bins to regulate material flow.



Style A aprons with Type K or A chain attachments furnished as machinery parts for many applications.

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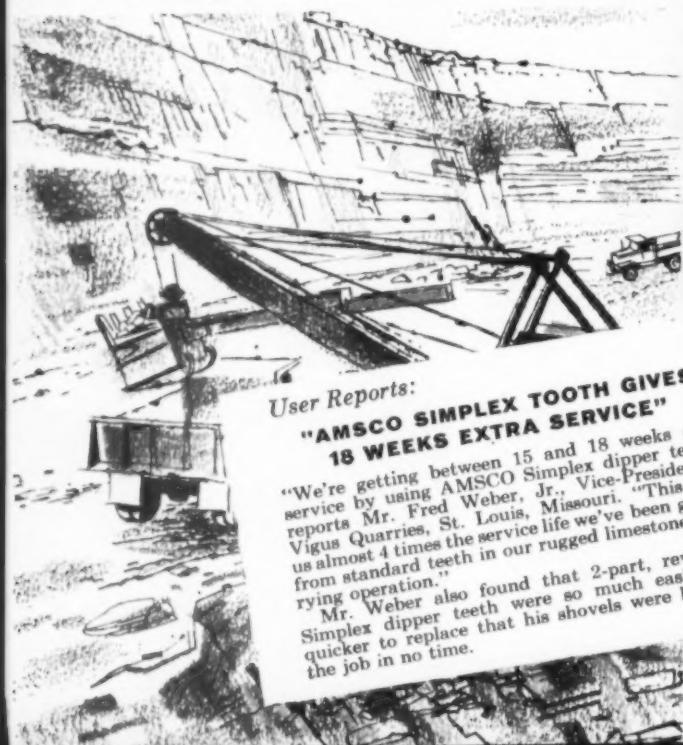
"Working in semi-molten slag at temperatures up to 1800°F., an AMSCO 'MML' ALLOY dipper front lasted 528 days. That's 13 times more service life than we got from the type previously used . . ., which gave a maximum of only 40 days' service." AMSCO "MML" ALLOY is a special combination of austentic manganese steel and molybdenum, specifically developed for applications involving excessive heating as well as severe abrasion.



User Reports:

"AMSCO SIMPLEX TOOTH GIVES 18 WEEKS EXTRA SERVICE"

"We're getting between 15 and 18 weeks extra service by using AMSCO Simplex dipper teeth", reports Mr. Fred Weber, Jr., Vice-President of Vigus Quarries, St. Louis, Missouri. "This gives us almost 4 times the service life we've been getting from standard teeth in our rugged limestone quarrying operation."

Mr. Weber also found that 2-part, reversible Simplex dipper teeth were so much easier and quicker to replace that his shovels were back on the job in no time.

MORE TONS PER DOLLAR

For rugged digging, crushing, pumping, or rebuilding jobs... it pays to ASK for AMSCO!

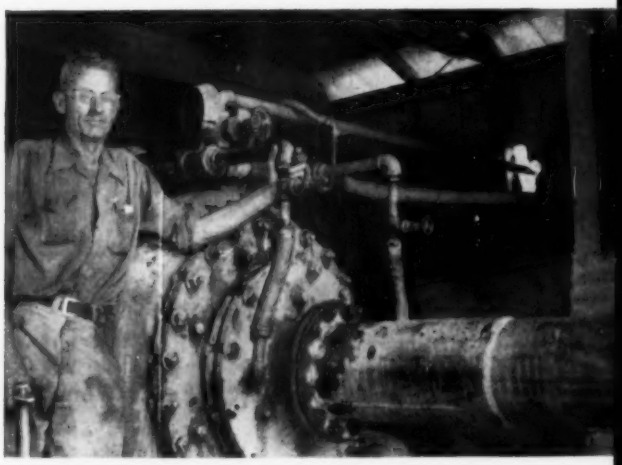
AMSCO's sole job is to help you fight wear caused by impact and abrasion. AMSCO Manganese Steel—"the toughest steel known"—is today's number one choice for long-lasting dippers, dipper parts, crushers, tractor parts.

AMSCO Alloys, developed to meet unusual wear problems, add extra service life under special and very severe operating conditions.

AMSCO Hardfacing Materials permit economical build-up or repair of worn parts—at a fraction of the cost of new parts. Use this specialized know-how and broad line of "wear-fighting" products to help *your* equipment move more tons per dollar. Ask for AMSCO!

NOW...WELD MANGANESE AS EASILY AS MILD STEEL

"We're getting just the kind of welds and build-up we want with good cost saving to boot," says a user of Nicro•Mang rod. From all over, in a variety of hardfacing applications, reports of success with AMSCO NICRO•MANG are coming in. Users like the stable arc, and wide range of arc length . . . the non-popping, the easy removal of slag . . . and above all the fast build-up. For high strength, superior crack resistance, and easy welding, Nicro•Mang is unbeatable for fabrication and build-up of manganese steel.



"29 YEARS WITH THE SAME 8" AMSCO PUMP"

Haskell Peel, Plant Superintendent at Consolidated Gravel Company, Columbus, Georgia, has shared many experiences with his 8" AMSCO PUMP. One of his favorites is the time that he and his pump almost dried out a lake to recover a sunken dredge. He hooked the 8" AMSCO to more than 1,000 ft. of 10" pipe, and ran it continuously for three days. No wonder the pump is his pet . . . it's been doing the job, pumping 75% sand and 25% gravel, for more than 29 years.

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Welding products distributed by Canadian Liquid Air Co., Ltd.

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new machinery

● With the purchase of three new Type 43-M machines from the Marion Power Shovel Company, the Allentown Portland Cement Company has increased its inventory of Marion excavators to nine units. Two of the new 1-cu. yd. Type 43-M's are equipped with combination drag-clam-crane front ends, and are used for rehandling material, general maintenance, road work, and drainage ditch excavation at Allentown's West Conshohocken plant.

In use at the Evansville plant, the third 43-M has both a hoe and a clamshell front end. As a 1-cu. yd. hoe it is used for digging drainage ditches and for road work. The clamshell front is used for rehandling chores. (351)

● The Thew Shovel Company has introduced an 80-ton rubber tire Moto-Crane, the Model MC-875, which includes among its features shear ball turntable mountings, two-lever "joy stick" air controls, square-tubular-chord boom, and one-piece cast steel carrier frame.

Boom sections are pin connected for faster assembly up to 200 ft., plus a 40-ft. tip extension, also of square-tubular-chord construction.

The turntable is mounted on the carrier by the Lorain Shear-Ball method—a single ball race design mounting in which 70 hardened steel balls snugly sealed in hardened, precision-ground steel races take all the

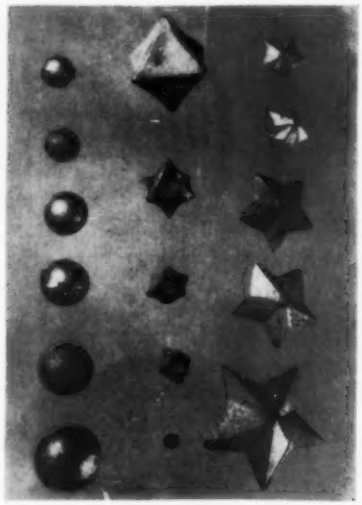
vertical, horizontal, and radial loads and thrusts. There is no need for a center pin and nut, a centering gudgeon, or any type of turntable rollers.

Metered air operation, via "joy stick" hand level control, feeds air power to the clutches at any rate of flow and in any amount desired.

The backhoe of the Moto-Crane Carrier is a single piece box section frame of alloy steel casting, extending from the front bumper to the rear outriggers, with mounting plate, mounting pads, fore-and-aft outrigger boxes, all cast as an integral part of the frame. Ten travel speeds up to 20 m.p.h. are available. (352)

● Abmet, an abrasive-resistant cast metal developed by Quincy Foundry, Inc., is now available in grinding balls and cleaning stars as well as special applications such as friction bearings and parts for abrasive-material handling equipment.

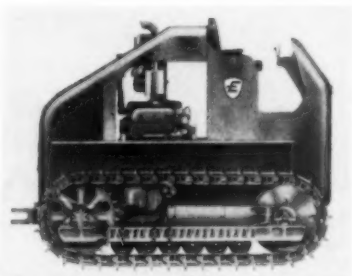
Grinding balls which can be used for grinding, pulverizing or burnishing materials such as cement, min-



erals, and sand are available in sizes ranging from ¾ in. through 1¼ in.

Five and six point stars, cast in sizes ranging from 1 in. through 3 in. are available for use in cleaning, de-burring, and burnishing ferrous and non-ferrous metallic castings, forgings, and weldments. (353)

● The Eimco Corporation has developed new 100-hp. tractors and tractor units called the 103 Series as a companion to the larger and heavier 105 Series. They are manu-



and equipment

for further information use card on page 255

factured with Stress Flow Construction, claimed to be a new method of casting heavy steel in large sections with the castings molded to the scientifically established stresses and shapes required. Thus, the entire track frame and diagonal brace is cast of electric steel in one piece.

The final drive, center housing and main frame are also produced in one heavy steel casting. Castings can be welded as required for repairs and all components are readily accessible and removable.

Another feature of the 103 series is called Quadra-Torque torque converter which, teamed with Eimco's Unidrive, offers full hydraulic actuation on four forward and four reverse gears. This power shifting is reported to be possible at any engine or tractor speed.

The new series will be available in four basic units, including front-end loader, fork lift, and other attachments. The 103 tractor is 11 ft. 6 in. long, 7 ft. 9 in. high, and 76 in. wide, has a ground clearance of 17 in. and a minimum turning radius of 78 in. It develops 13,500 lb. drawbar pull; the front-end loader has a 1¾-cu. yd. capacity and 23,000-lb. pull, both increasing to 33,000 lb. drawbar pull. (354)

● American Manganese Steel Division, American Brake Shoe Company, offers a redesigned semi-automatic welder for hardfacing in the shop or in the field. Lightweight and portable, the machine is used to build up dipper teeth, dipper lips, crusher rolls, and hundreds of other parts that cannot be hardfaced with fully automatic equipment.

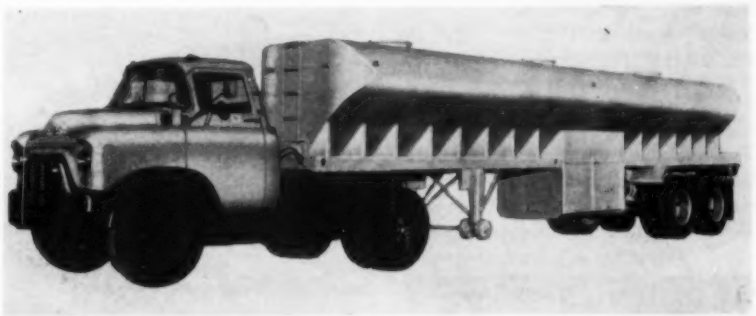
The welder is connected to any 300 amp, or larger d.c. power source and feeds hardfacing wire through a hand held electrode holder whenever the holder switch is depressed.

The machine is completely enclosed to avoid shock hazards, and to protect the reel of wire. Hardfacing or build up of material can be laid on continuously at a very high rate, without the waste of time or material normally required when using stick electrodes. (355)

● The De Laval Separator Company has contracted for exclusive rights to manufacture, sell, and service the newly-developed Syncro-Matic screen separator, which features three dimensional controlled motion

of its screening surface by calibrated settings. In addition, the Syncro-Matic permits motion in each direction to be selected. Mixing action imparted to the material handled can be varied from highly turbulent to intense but gentle.

The machine, developed by State Steel Products, Inc., will process a wide range of bulk materials. It is available with one, two, or three decks in either plain or stainless construction. (356)



● Baughman Manufacturing Company has designed a bulk transport body with a combination air-mechanical discharge system for carrying cement and other free-flowing materials. The SST-11P air-mechanical discharge elevates cement up to 100 ft. at a rate of ¾ t.p.m.; its straight mechanical discharge unloads materials into pit or conveyor at an approximate rate of 1 t.p.m.

Other engineering features incorporated into the SST-11P design are Baughman's patented steel housing over the body auger which forms an air-cell to provide uniform flow and prevent slugging; an unpressurized tank which stops condensation and formulation of solidified matter; and split body auger for unloading the rear half and the front half in sequence. The SST-11P body is fabricated on heavy 13 gauge steel or optionally in aluminum, reinforced with box-type jacks and internal perforated bulk heads. (357)

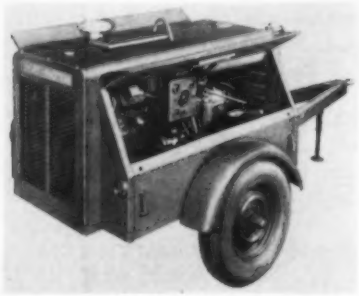
● Plibrico spray mix, a refractory material produced by the Plibrico Company, is recommended for use where continual servicing is required; it is also useful for making emergency repairs to keep the furnace in production until shutdown is feasible.

This refractory gunning mix is usable with all types of wet mix or nozzle mix equipment with low rebound. It can also be trowelled into place. Application can be made to hot or cold walls.

Excellent abrasion-resistant and acid-resistant features are claimed for Plibrico spray mix. The service temperature of this material is from 200 deg. to 2,500 deg. F. The fusion point is P.C.E. Cone 29 (3,020 deg. F.). (358)

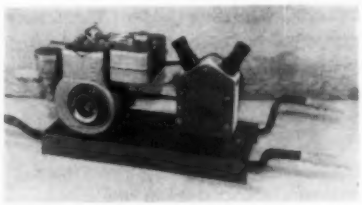
● More than 6,000 sq. ft. of open flooring—electroforged grating fabricated by the Blaw-Knox Company—was installed at a midwest cement plant to assure greater visibility and air circulation in two new grinding mills and a new kiln building. In addition, the grating provides safer footing through a roughened, twisted bar surface.

These steps lead from the cooler area to a 450 ft. long catwalk which runs parallel to a kiln. (359)



● A low operating speed of 1,800 r.p.m. permits economical operation and maintenance of the Worthington Corporation's new 850-ft. Super Blue Brute single-stage, portable air compressor. Engine life is further extended by a clutch which permits warm-up without load. In addition, the 168-hp. Continental gasoline engine has a reserve power capacity of over 50 percent.

The Super Blue Brute has discharge pressure setting of from 75 to 125 p.s.i. The unit has wide track wheels and a lower center of gravity which permit safe towing at high speed, and full-length tool boxes for maximum storage space. (360)



● Latest addition to the Vanton Pump and Equipment Corporation's line of plastic sealless pumps is the Tote-A-Pump, a portable unit for pumping corrosive and abrasive materials.

The unit pictured is the Vanton Model XB120, with a capacity of 20 g.p.m. The power plant is a 2.3-hp. air-cooled gasoline engine which operates the pump at 1,200 r.p.m. This model weighs 65 lb.

Tote-A-Pumps are available in a capacity range of from $\frac{1}{10}$ gal. to 40 g.p.m., and can be provided with belt guards and recoil engine starters. Pump body blocks and liners are available in a variety of corrosion resistant plastic materials. (361)

● The Weserhutte multi-bucket excavator is manufactured in several models with outputs from 40 to 588 cu. yd. per hour and bucket capacities from ½ to 8⅞ cu. ft. Available on rails or crawlers, they are ideal for excavating sand and gravel, as well as for pumice and clay extraction.

Manufactured in West Germany by Weserhutte Ottol Wolff G.m.b.H., the excavators are distributed in the United States by the Combined Agencies Corporation. (362)

Lowering Operating Costs— Increasing Plant Efficiency

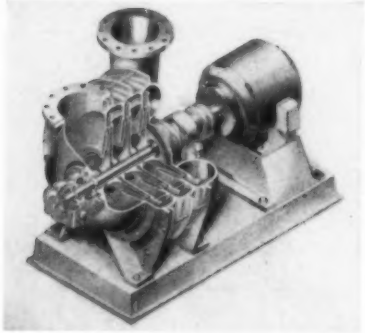
The use of air offers great prospects for increasing industry's productive capacity.

—Thomas Alva Edison

A Prophecy Comes True

The noted inventor also remarked if he had his life to live over, his field of specialization would be air in the service of industry. More than a quarter century ago, engineers for U.S.Hoffman followed Edison's suggestion. Pioneering in air appliances, they developed heavy duty stationary and portable industrial vacuum cleaning systems. Today, those early Hoffman machines as well as modern stationary and portable vacuum cleaning units are in use in thousands of plants. Cleaning hard to get at areas, reclaiming materials or protecting the finish and quality of semi-finished products, they are a significant factor in lowering operating costs and increasing plant efficiency.

Lifetime Trouble Free Operation

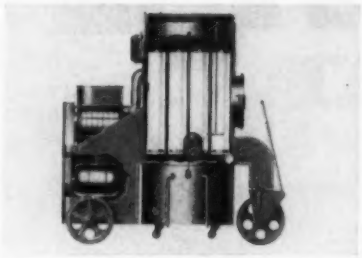


Heart of all portable and stationary vacuum cleaning systems is the centrifugal exhauster which produces the vacuum.

Sturdy, one piece cast aluminum impellers are statically and dynamically balanced. There are no internal wearing surfaces. Operation is efficient, trouble-free for the life of the machine.

Heavy Duty Portable Equipment

Typical of the eight standard heavy duty portable units ranging from 1½ to 15 HP is the powerful two sweeper Hoffco-Vac #75. Compact construction and streamlined design allow for easy maneuverability. All units have large filtering areas to insure complete and effi-



cient collection of the finest dust particles. Parts are readily accessible for inspection and servicing.

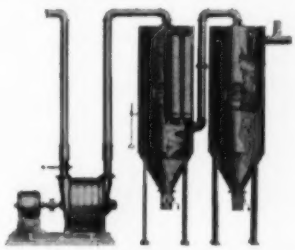
Installation of permanently fixed piping extends the machine's capabilities to otherwise virtually inaccessible areas.

Send for Literature P8.

Unlimited Cleaning

Hoffman permanently installed stationary vacuum cleaning systems permit simultaneous cleaning operations in widely scattered points throughout the plant with collection of material at one central location. This effectively eliminates expensive manual handling and disposal.

The system includes a more powerful and larger centrifugal exhaust-



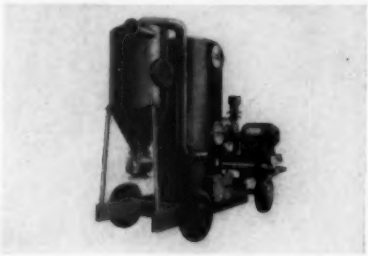
er than employed in portable units. Heavy duty dust separators collect the material and large filtering areas insure thorough cleaning of the air. Hoses for cleaning are inserted into strategically located inlet valves in the piping system and are conveniently located throughout the areas to be vacuumed. Stationary equipment helps prevent product contamination and cuts down time to a minimum.

In addition, these versatile systems salvage valuable materials, insure better housekeeping and encourage operating efficiency.

Send for Literature AB 100.

Equipment For Special Needs

Hoffman designs and manufactures special purpose vacuum cleaning equipment such as this unique trailer unit used to remove catalyst from "cat crackers" during turnaround. Built for the Texas Co., it is in use at one of the world's largest oil refineries at Port Arthur, Texas.



A Genuine Competitive Advantage

Wherever operating costs make the big difference in profits, Hoffman industrial vacuum cleaning systems offer many genuine competitive advantages. They are extensively used in food and chemical processing, textiles, precision component manufacturing and assembly and just about every type of manufacturing plant. Whatever your vacuum cleaning requirements, Hoffman can design and engineer systems to do a thorough and efficient job.

Free Booklets

Ask for a free engineering survey to determine the most economical Hoffman system for your plant. Send now for any of these helpful free booklets.

Kindly send the following FREE booklets.

☐ P8—How Portable Vacuum Cleaning Systems Cut Costs, Increase Plant Efficiency.

☐ AB-100—How Stationary Vacuum Cleaning Systems Cut costs, Increase Plant Efficiency.

U.S.HOFFMAN MACHINERY CORPORATION

Air Appliance Division
103 Fourth Avenue
New York 3, N. Y.

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COMPANY _____

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Enter 55 on card, page 255

when the going gets rough-

give 'em "L"

When the bite is on the dragline, you'll be glad you rigged with *Leschen*—the wire rope that's the same top quality in every foot of every reel. The new Leschen wire mill is designed to deliver exactly that. New machines . . . new processes . . . exclusive new continuous-flow technique—all as modern as tomorrow. Try Leschen Red-Strand Wire Rope now and see how its uniform quality makes your operation safer, your replacement time farther in the future. Make your next order Leschen! *Leschen Wire Rope Division, H. K. Porter Company, Inc., St. Louis 12, Mo.*

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H.K. PORTER COMPANY, INC.

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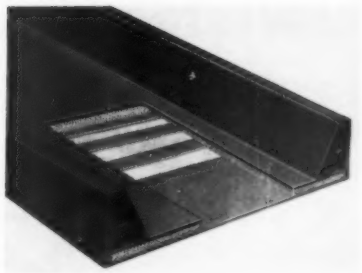

● A flange edge conveyor belting which eliminates the use of troughing idlers is now available from The MonoBelting Corporation. This new one-piece belting is pre-tensioned to flex as it passes around the pulleys, eliminating fatigue due to flexing and allowing belt speeds higher than troughed flat belts permit.

Monobelt reportedly delivers up to 200 percent more material than a conventional troughed belt of the same width traveling at the same speed. With an increased cross-section area, higher angles of inclines are possible because MonoBelt traps the material on three sides.

The new belting is available in widths from 8 to 48 in. Flanges sizes range from 1 to 3 in. **(363)**

● Manitowoc Engineering Corporation's newest addition to its line of power cranes and excavators is the Model 3100, a 2½-cu. yd. shovel readily converted to clamshell, backhoe, dragline, or crane.

For movement by truck or train, complete crawler assemblies are removed, bringing width and height well within ordinary shipping clearances. The self-removing counterweight feature also aids in weight and bulk strip-down and an overall

B.F.Goodrich

B.F.Goodrich tires handle the tough jobs at mammoth Niagara Power Project

UNDER construction at Niagara Falls, N.Y., are the powerhouse, waterways, reservoir and intake—all part of the gigantic $720-million Niagara Power Project. Shown above: site of 110′ x 50′ excavation for one of the twin, 46′-wide, covered intake conduits. On the job: a fleet of trucks equipped with B.F.Goodrich tires and owned by Merritt-Chapman & Scott Corporation, largest contractor on the project.

These trucks haul ton after ton of rock and overburden from the excavation to the spoils area, work round-the-clock, 6 days a week, under severe operating conditions. In spite of this, B.F.Goodrich Rock Service tires are still going strong after 3,135 hours of service!

The Rock Service tread is specially-compounded to resist rock cuts and snags. Massive double-chevron cleats give extra traction in forward or reverse. Thanks to the special B.F.Goodrich FLEX-RITE NYLON cord body, Rock Service tires are virtually immune to heat blowouts and flex breaks. Result: you get longer tire life—more retreadable tires!

Other B.F.Goodrich products at work on the Niagara Power Project are conveyor belting, air hose, protective clothing and footwear. Maintenance and service programs for tires and industrial products are also in operation—all part of the new B.F.Goodrich Unified Contractor Program. No matter what your off-the-road job, B.F.Goodrich is ready to serve you—and help you save. Your Smileage dealer is listed under Tires in the Yellow Pages of your phone book. *The B.F.Goodrich Co., Akron 18, Ohio.*

Specify B.F.Goodrich Tubeless or tube-type tires when ordering new equipment

Smileage!

B.F.Goodrich *off-the-road tires*

TO KEEP EQUIPMENT ON THE JOB AND CUT COSTS... HARDFACE WITH AIRCO TUNGTUBE

If you're chewing into granite, shale, coal or other non-metallics, build up your equipment surfaces with Airco hardfacing alloys. Take Airco Tungtube. Great for cutter bits, core bits, drill bits, dredging cutters and many other kinds of pit and quarry tools.

Deposition rate is high. Cost low.

Tungtube is the preferred stick among operators too, because of its easy handling ways in either bare or coated form.

TO IMPROVE YOUR HARDFACING AND WELDING OPERATIONS... CALL IN YOUR AIRCO MAN

Somewhere along the line you can draw a profit from Airco experience in hardfacing and welding. Airco makes hundreds of electrodes of all classes and types . . . produces all industrial gases used in hardfacing and welding . . . makes a full line of high performance hardfacing and welding equipment and supplies.

We'd like to help you. Call your nearby Airco office or Authorized Airco Dealer. See the Yellow Pages under "Welding Equipment and Supplies."

The pure tungsten carbide particles in Airco's Tungtube hardfacing electrode are of uniform size. Cubical diamond form presents the maximum number of high strength cutting edges. This is typical of the features that give "nine-life" performance to equipment rebuilt with Airco Hardfacing Alloys.

Tungtube withstands severest abrasion. Hardness over 80 Rockwell C. Screen sizes 10-20, 20-30, 30-40, 30-down and 10-30.

Other Airco Hardfacing Alloys include Airco 361 — for build-up and repair of manganese steel — withstands severe impact and considerable abrasion. Aircolite 59—for superior abrasion resistance. Airco 388—an all position, self hardening electrode — resistant to impact and abrasion.

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Enter 58 on card, page 255

outside width of 11 ft. 1 in. maximum means the 3100 can be put on a flat car without extensive preparations or dismantling.

Shovel boom strength is obtained through the use of an alloy steel boom welded in elongated tubular form. The crowd mechanism of the 3100 is positioned to eliminate off-center strain on the drum shaft. A smooth disc-type clutch on the main drive shaft powers the high speed retract.

The crawler base is engineered for permanent alignment of components. A single piece carbody is fastened directly to the crawler frames. Other features include a 9½-in. diameter alloy steel king pin; self-cleaning crawler drive; and simple jack adjustment of crawler treads through the use of adjustment shims. Regardless of cab position, the 3100 enables positive steering in either direction and the ability to idle or lock either crawler.

Simplicity of design is also featured in the upper deck machinery. There are 14 gears including the boom hoist, and only the working gears turn due to Manitowoc's Power-flo slide pinion.

Rapid and safe raising and lowering of the boom is provided by the double drum boom hoist which is designed to equalize pull on the boom and lessens cable wear. Standard equipment includes modern air-controls and a torque converter. An optional accessory, which is especially convenient for steel setting or maneuvering in tight spots, is the independent swing. (364)

● Keystone Lubricating Company has developed a premium quality, multi-purpose lubricant known as Keystone No. 88. This product has application in 90 percent of all ball

Enter 59 on card, page 255 →

TWO LORAIN MOTO-LOADERS MOVE 5000 YARDS OF STONE A DAY

Working at the Austin Plant of the Texas Crushed Stone Company, each 2-yard Lorain Moto-Loader averages 2500 yards of crushed limestone in a ten hour day. Moving between stockpiles and trucks, these husky Moto-Loaders have the maneuverability and capacity needed for fast loading operations. Balanced weight distribution lets them carry the big loads without bounce, jiggle, or chatter.

Toggle-in hoist lever permits no-hands, constant hoisting force . . . lets the operator concentrate on bucket tilt control for bigger pay loads. Special arm design provides maximum visibility, safe operation. Other Moto-Loader features include: torque converter, power shift transmission, planetary wheel drive and four wheel hydraulic brakes.

One-foot travel control speeds loading cycles. Pivoting one foot between two adjacent pedals moves Moto-Loader forward or backward. Depressing pedals further provides acceleration. Both hands are free for steering and other operations. Power booster steering assures maximum maneuverability.

Ask your Lorain distributor about the 2-yard ML-157, or the 1¾-yard Lorain ML-153 (6,000 pounds capacity). Either one will boost your output and your profits.

THE THEW SHOVEL COMPANY, LORAIN, OHIO

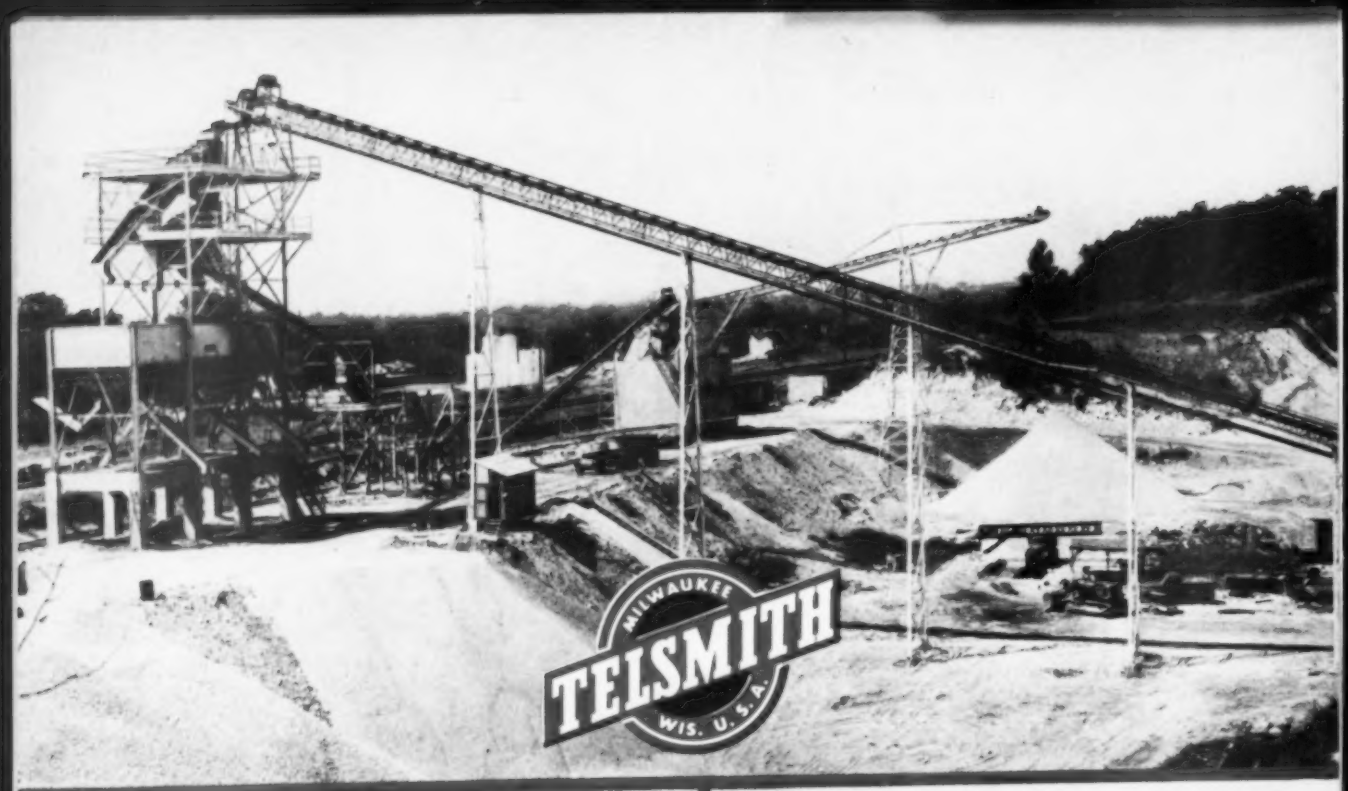
LORAIN®

ON THE MOVE

PLANTS in Lorain, Elyria and Bucyrus, Ohio.

PRODUCTS—Power shovels, cranes, draglines, clamshells, and hoes on crawler mountings from ⅜- to 2½-yard capacity. Cranes from 7 to 80 tons . . . on crawlers, and as rubber-tire Moto-Cranes, and Self-Propelled Cranes. Rubber tire front-end Moto-Loaders in 1¾- and 2-yard models.

OUTLETS—Lorain products sold and serviced by 249 distributor outlets throughout the world.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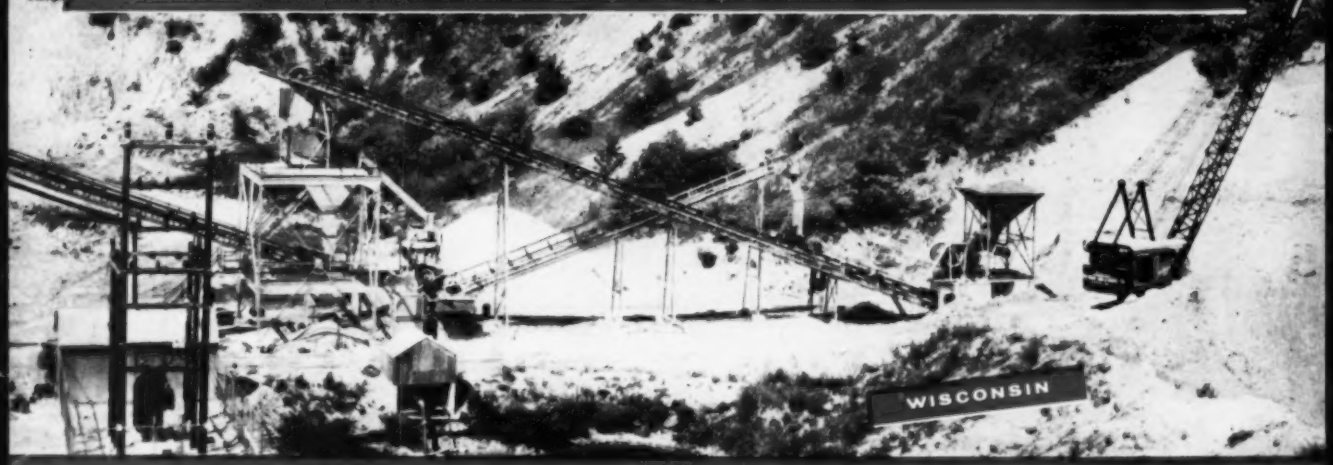

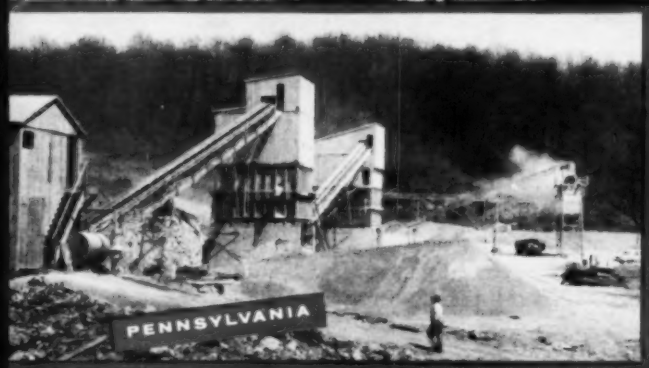

Your plant will be modern and compact in design. Its equipment will be easily and quickly installed ... engineered for big capacity, product flexibility, and low cost, efficient operation with minimum manpower—if it is *Telsmith* designed-and-equipped.

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● *Names and locations of these plants gladly furnished on request.*

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Now *Western*® offers a complete line of "job-designed" ammunition . . .

SUPER-X SHELL—For use in kilns over 150' long. Develops 8900 ft. lbs. of muzzle energy—breaks hard rings quickly and efficiently.

REDUCED VELOCITY SHELL—Lower-powered (approximately 7500 ft. lbs. muzzle energy) for ultimate efficiency in shorter kilns . . . minimizes possibility of damage to end plates, feed pipes, etc.

SUPER-X ZINC SHELL—Extra-large zinc slug penetrates toughest rings. Use them with Super-X lead slugs for maximum penetration and "knock-down" power.

for more efficient, economical kiln ring removal with

RINGBLASTER MARK I KILN GUN

Western "job-designed" ammunition and Ringblaster gun team up to provide the very finest ring-removal system ever known. Of special interest to economy-minded kiln operators is the amount of "down-time" eliminated when Ringblaster takes over ring removal problems.

Only Ringblaster has so many plus-features: special mount, stronger springs, heavier longer barrel, improved gears, greater accuracy, sound reducer and short-stroke operating lever. It will pay you to send for more details!

In addition to Ringblaster®, the versatile Ramset System includes Ramset powder-actuated and Shure-Set® hammer-in tools and fasteners.

OLIN MATHIESON CHEMICAL CORPORATION
KILN RINGBLASTER GUN

Ramset Fastening System

WINCHESTER-WESTERN DIVISION • OLIN MATHIESON CHEMICAL CORPORATION
12175-G BEREA ROAD • CLEVELAND 11, OHIO

Enter 62 on card, page 255

and roller bearing installations, and is also effective in plain bearings, needle bearings, and on rotating and sliding surfaces.

A high-film-strength lithium base product, Keystone No. 88 is described as smooth, non-fibrous, homogeneous, and odorless, with excellent water repellent and absorptive properties. The lubricant has an operating temperature range of from 0 to 275 deg. F., and a melting point close to 400 deg. F. It does not thin out under heat. **(365)**

● New design features and the use of T-1 steel increase the payload, durability, and operating efficiency in the PR619, a 25-ton member of Athey Products Corporation's new T-line.

Stronger and tougher T-1 steel of 100,000 minimum yield strength resists the impact abuses and abrasion of earthmoving operations, trims dead weight, and substitutes 15 percent extra payload. PR619 hauls up to 20 cu. yd. heaped on a 2:1 slope, or 25 tons—more than 2½ times its own weight.

T-line design adds flared body top for bigger loading target with no increase in trailer width; spill deflectors to retain load and protect tires and hydraulic system during loading; reinforced cellular floor with spacer bars welded between upper and lower floor plates, to add strength and simplify installation of body heating; self-aligning hoists; a new hydraulic system featuring a gear-type pump, full-floor filtering and fittings; 12 second dumping with fast-acting hoists and straight 57-deg. dump angle off the lip. Speeds up to 30.2 m.p.h. are obtained with the new Caterpillar No. 619 tractor. **(366)**

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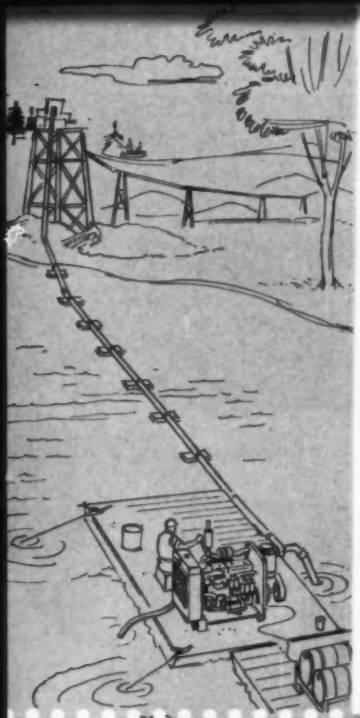
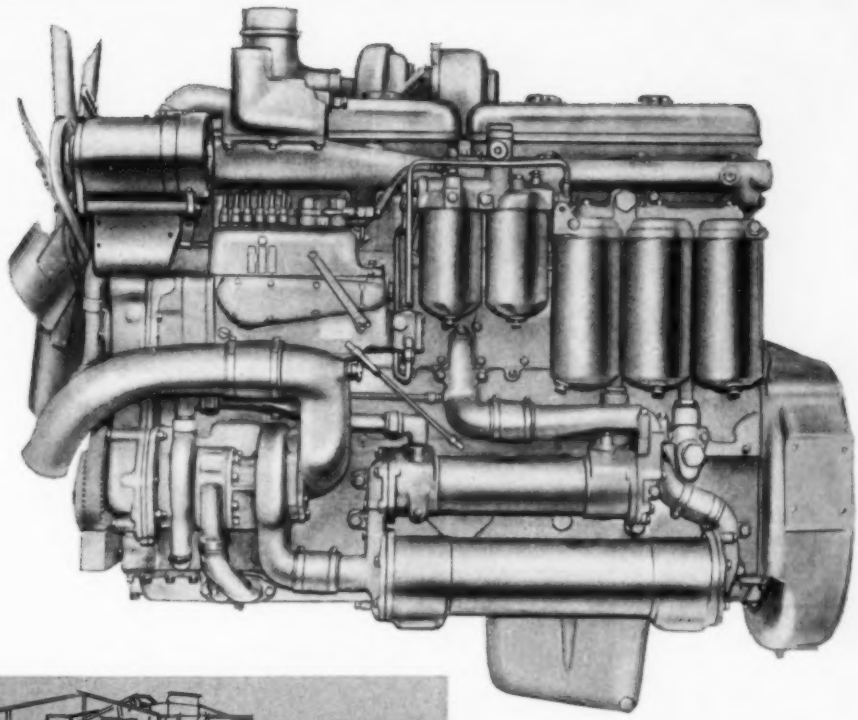
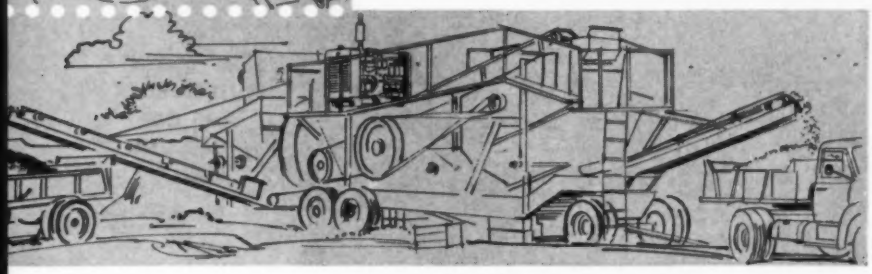






NEW UDT-817 DIESEL is a 4-cycle turbocharged engine with 817 cu. in. displacement and max. torque of 1,040 lbs. ft. @ 1,400 rpm.

New power, performance and price leader in the 385-hp diesel class

Here are three fast facts about the turbocharged new direct-start, direct-injection International 6-cylinder UDT-817 diesel that can mean big savings on your crusher and pump power:

POWER—The UDT-817, developing 385 hp., leads the field in its size class.

PERFORMANCE—The specific fuel consumption of the UDT-817 is the lowest in its size class.

PRICE—The UDT-817 is the lowest priced engine in its size class in dollars per horsepower.

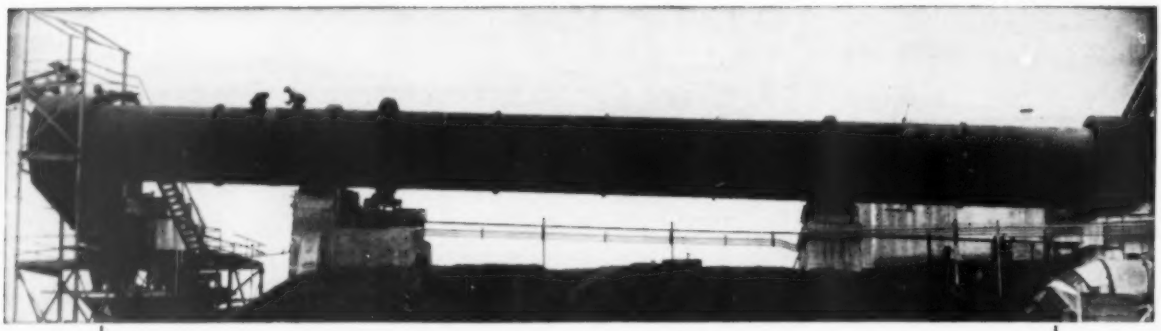
A wide variety of accessory equipment including air cleaners, flywheels for leading makes of torque converters and clutches, torque converter cooler, air control compressors, safety shut-offs, instruments and engine controls can be furnished to meet your installation requirements. Base, radiator, hood and dash, clutch and power take-off are available for complete power units.

The new 250-hp. D-817 is the naturally aspirated version of this same basic diesel engine. Your nearby International Power Unit Distributor or Dealer can give you full details of either new model or on the 30 other diesel and carbureted pit and quarry engines in his line. All 32 engines have one common feature—fastest payback power for users.

International® Construction Equipment

International Harvester Co., 180 North Michigan Ave., Chicago 1, Ill.

A COMPLETE POWER PACKAGE: Crawler and Wheel Tractors . . . Self-Propelled Scrapers and Bottom-Dump Wagons . . . Crawler and Rubber-Tired Loaders . . . Off-Highway Haulers . . . Diesel and Carbureted Engines . . . Motor Trucks . . . Farm Tractors and Equipment.



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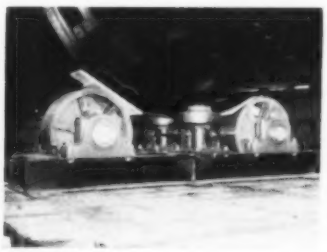
Manufacturers of DRYERS KILNS, COOLERS DUST COLLECTORS LIME HYDRATORS ELEVATORS CONVEYORS

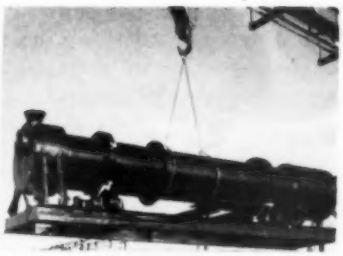
LIGHTWEIGHT AGGREGATE PLANT, New Lexington, Ohio
(Kiln & Cooler supplied by us)

Engineers and Contractors for LIME, CEMENT CRUSHED ROCK AND ORE PROCESSING PLANTS

DRYER BEING LOADED



SUPPORTING MECHANISM FOR DRYERS



EXPERIMENTAL KILN

W. P. HEINEKEN, INC.

Established 1918
50 BROAD STREET, NEW YORK 4, N. Y.
Engineers and Manufacturers

A longer-lasting REVERSIBLE cap and adapter...

Try this on- for SAVINGS!

Service-proved WEARPACT Cap Type Tooth —with foolproof retainer—cuts digging costs to record lows . . . even in taconite!

Probably by now you've heard of Wearpact Steel—the alloy with a combination of hardness and toughness not available in any other commonly used alloy.

Here's a new tooth and adapter design* cast in longer-wearing Wearpact . . . the ASF Cap Type Tooth and adapter that's reversible for longer life. Note that the tooth itself is self-sharpening. Keeps on *slicing* through the ore and overburden—and when finally worn, there's less metal to throw away. *The tooth locks securely to the adapter.* No ASF retainer has ever failed in service.

As for service life, the cost-per-ton figures in large mines speak for themselves. Lowest of any tooth on record! Give this dollar-saving tooth a try! Write today to arrange for an installation.

Cut your costs with WEARPACT

CAST ALLOY STEEL

A PRODUCT OF

AMERICAN STEEL FOUNDRIES

3800 Canal St., Indiana Harbor, Indiana

In Canada: International Equipment Company, Ltd.
Montreal 1, Quebec

*Patent Pending.

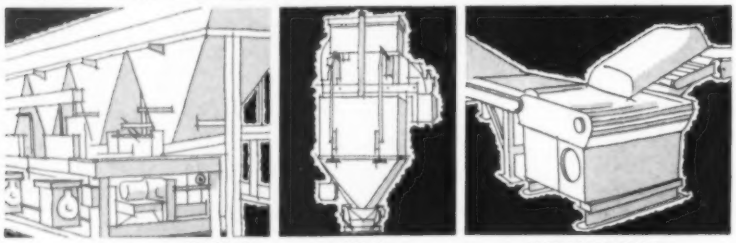
Early man was aware of the progressive inaccuracies of his pivot balance scales . . . but none knew how to remedy the situation.

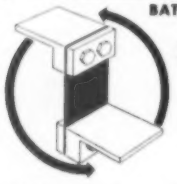
The problem was solved in 1956 when the United States issued a patent for a "Thayer Flexure Plate" Leverage System. A team of engineers and businessmen aware of industrys tremendous cumulative loss of materials in weighing operations, had devised a revolutionary new scale.

Knife-edge pivots that progressively wear and change were replaced by Thayer Flexure Plates that move only .001", yet accurately reflect the minutest changes in weight. This *firmly joined* lever withstands shocks and vibrations indefinitely. Dirt and dust are no longer a problem. Thayer guarantees this leverage system accurate for the life of the scale.

How Can It Save You Money Year After Year?

Working in conjunction with straight electrical controls, it forms the most reliable, low maintenance system ever devised to control processing or materials handling *by weight*. Literature on its application to filling, batching and checkweighing operations is available on request.





THAYER SCALE

AUTOWEIGHTION SYSTEMS FOR FILLING, BATCHING AND CHECKWEIGHING

THAYER SCALE CORP. • 24 THAYER PARK, PEMBROKE, MASS.

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Labor Developments

(*From p.* 13)

ly filed unfair labor practice charges with the National Labor Relations Board. The question of whether NLRB should issue a complaint in this matter was referred to its general counsel. The latter issued a rather forthright ruling which stated the following:

"In a recent representation case, the Board found that an historical multi-employer, rather than a single-employer, unit was appropriate, stating that where actual bargaining negotiations based upon an existing multi-employer basis had begun, the employer may not, in the absence of mutual consent or unusual circumstances, abandon the multi-employer unit. In the instant proceedings, it being established that the union and association were actually engaged in contract renewal negotiations on a multi-employer basis, with no impasse having been reached therein, the union's solicitation of employers concerned to disassociate themselves from multi-employer bargaining through the execution of individual contracts appeared to constitute bad faith bargaining, when appraised in the light of the cited case. Moreover, a substantial basis could be said to exist for a finding that such solicitation, occurring in the context of threatened strike action, constituted restraint and coercion of the employers concerned in their selection of a bargaining representative . . ."

He remanded the case to his regional director for the issuance of a complaint. If the action is followed through and the union is actually found guilty of failure to bargain in good faith, this case may have nipped in the bud a new type of whip-sawing practice which would be especially harmful to the many situations in which labor relations stability has been obtained through the effective use of multi-employer, association, collective bargaining.

First quarter sales of $102,361,998 and common stock earnings of $13,191,419, equal to 78 cents a share, have been reported by Minnesota Mining & Manufacturing Co. It was the second-best quarter in the company's 57-year history.

For 50 years Hughes has pioneered every advance in cone-type rock bits

Starting with the first Hughes bit in 1909, that introduced the principle of rolling conical cutters, every major breakthrough in cone-type rock bit design has been pioneered by Hughes.

And for three very significant reasons:

1) A first-hand knowledge of the needs of the industry gained in the field.

2) A continuing research program devoted to improving rock bit performance and drilling techniques.

3) The industry's greatest experience in designing and manufacturing rock bits.

Today, you can look to Hughes, as the industry has for 50 years, for leadership in developing rock bits that will enable you to get maximum performance out of your drilling equipment.

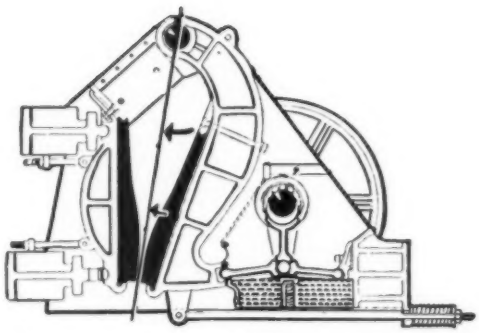
50 YEARS 1909 1959

HUGHES TOOL COMPANY

50TH ANNIVERSARY YEAR 1909 – 1959

10,000 tons of rock per day for 2 years on KUE-KEN CRUSHERS® original jaw plates & liners

The $1,000,000 Auburn, California, plant of Clements Rock Products, Inc., a complete *Kue-Ken Crusher* installation producing over 1,100,000 tons of paving and concrete materials for Sierra Nevada highway and Squaw Valley Olympic facilities construction, has operated continuously for 2 years with no maintenance downtime. Rubbing, the main cause of premature jaw plate and liner wear in conventional crushers, is eliminated by *Kue-Ken's* exclusive "crushing without rubbing" action. Jaw plates and liners of the *Kue-Ken* 16″ x 36″ jaw crusher and 36″ coarse bowl cone for primary crushing of hard rock glacial deposits and *Kue-Ken* 8″ x 36″ jaw and 36″ fine bowl cone for secondary crushing are still original equipment. Power consumption is far less . . . power is used to crush rock, not to wear out parts. *Kue-Ken* jaw crusher mechanism operates in a sealed, dust-free crankcase lubricated by filtered oil to permit higher speeds for greater capacity and a more uniform product. Automatic flywheel release prevents breakage from tramp iron.



Jaw plates last at least 5 times longer . . . only Kue-Ken crushes without rubbing.

See how hinge pin is located on the center line of the crushing zone. The jaw moves in an almost straight line. Rock is instantly gripped and crushed without rubbing.

WRITE FOR CATALOG

KUE-KEN® CRUSHERS

"Crushing without Rubbing"

STRAUB MFG. CO., INC. 8381 Baldwin St., Oakland 21, Calif.

Jaw Crushers Gyratory Crushers Overhead Eccentric Crushers Revolving Screens
Classifiers Feeders Rib Cone Ball Mills Concentrating Tables Vibrating Screens

DEALERS:

SEATTLE, WASH.	Washington Machinery Co.
BUTTE, MONTANA	Hall-Perry Machinery Co.
VANCOUVER, B. C.	Universal Equipment Co.
SALT LAKE CITY, UTAH	Lund Machinery Co.
SAN ANTONIO, TEX.	Closner Equipment Co.
LOS ANGELES, CALIF.	Garlinghouse, Fremon Co.
SAN FRANCISCO, CALIF.	Aggregates Engineers, Inc.
PORTLAND, OREGON	Air-Mac, Inc. of Oregon
BISMARCK, NORTH DAKOTA	Midwest Equipment Co.
PHOENIX, ARIZ.	Road Machinery Co.

Pennsylvania Crusher Division, Exclusive Licensed Eastern Manufacturer and Distributor, 323 S. Matlock St., West Chester, Penn.
Armstrong Whitworth (Metal Industries) Ltd., Authorized Licensed Manufacturer and Distributor. Close Works, Gateshead-upon-Tyne 8, England

Washington News Letter

(*From p.* 11)

whether the Administration is responsible or not, it is in the position of having to defend its action.

Ever since the Eisenhower Administration has come to power, there has been a great deal of discussion of the necessity for revamping the Federal Government's fiscal affairs. From the very beginning, there has been an attempt to substitute a long-term debt for the heavy burden of short-term obligations which mature virtually every few months. Each maturing involves a great deal of effort in getting the refinancing under way and operating without a hitch.

In addition, each re-financing involves a significant policy decision, which has its effect on the total money market. Each time a new refinancing comes up, there is a pause in activity awaiting the decision of the Treasury. If that decision is to increase the rate of interest on the new issue, this decision has its effect clear across the money markets. When the rate on this prime type of security rises, the rates on practically all other securities, with presumably greater risk, rise just about proportionately. Thus, the Treasury's activities, rather than stabilizing this market, tend to unstabilize it.

The final immediate problem which must be faced by the Treasury Department is the question of what to do about the rate on United States Saving Bonds. These are the bonds which are issued in small denominations, those which are generally bought by the average man, frequently through a payroll deduction plan. While the interest rates on these bonds have been raised somewhat, since their original issuance back at the beginning of World War II, they still pay a rate that is relatively very low. As a consequence, purchases of these securities are declining. They are being redeemed at a higher rate than they are being purchased.

This situation, of course, intensifies the other problems, because in addition to the moneys necessary to operate the government, it is also necessary to raise additional funds to pay the net difference between the savings bonds being bought and those being redeemed.

In connection with this problem, many congressmen differ in their positions on this issue. Because these bonds are held very broadly among large numbers of their constituents, they are generally in favor of an increase in their rate of return.

These immediate problems will, of course, be worked out before any serious crisis occurs. Unfortunately, the mood of Congress, particularly in this pre-election year, is not one which will permit any long-term solution of these fiscal problems. It is likely that temporary, partial, improvised measures will be taken again. These ultimately will only serve to confuse the issue further.

When the present administration came to office, these confused fiscal affairs were among the "messes" which the spokesmen promised to clean up. If this could still be done in the relatively short period remaining for the present incumbents, they would probably be making a greater contribution to long-range improvements in the operation of our government than almost any other accomplishment.

$20,000,000 Asbestos Deposit Reported in Newfoundland

A $20,000,000 asbestos operation is reported to be in the planning stage at Baie Verte, Newfoundland, Canada, for Advocate Mines Ltd., of Toronto. The open-pit operation will include deposits of about 22,000,000 tons worth $10.25 a ton or more, and up to 31,000,000 tons of $7.02-per-ton material.

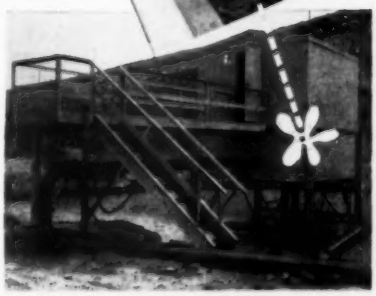
Among the firms interested in the development of the deposit are Canadian Johns-Manville, Patino of Canada, Amet Corporation, and Financiere Belge de l'Asbeste-Ciment.

Fifth Kiln Expands Output At Carolina Solite Company

The fifth kiln at the Aquadale, N. C., plant of Carolina Solite Company was recently activated, making it reportedly the world's largest lightweight aggregate producer, with a weekly capacity of 125 carloads.

Carolina Solite, which has a sales office in Charlotte, N. C., activated its first kiln in 1952.

SIX NAGLE PUMPS Drain ADIRONDACK OPEN-PIT IRON MINE!



The Nagle 10" Type "CWO-C" vertical-shaft pump shown is draining the open-pit iron mine of Jones & Laughlin Steel Corp. at Star Lake, New York—of water frequently heavily charged with solids. Its selection was based upon the good performance of other Nagle drainage pumps in their operation since 1944.

Nagle pumps are designed exclusively for abusive applications—handling abrasive or corrosive solutions or hot liquids. They have established brilliant performance records, cutting costs in mines, mills, quarries, and chemical processing plants. Learn more about them—send for Nagle Pump Selector.

NAGLE PUMPS

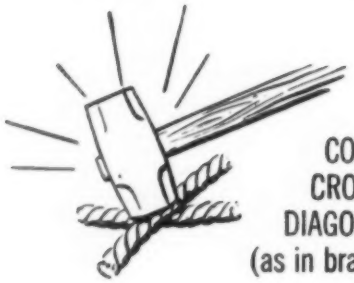
NAGLE PUMPS, INC.
1208 CENTER AVE., CHICAGO HEIGHTS, ILL.

PUMPS FOR ABRASIVE AND CORROSIVE APPLICATIONS

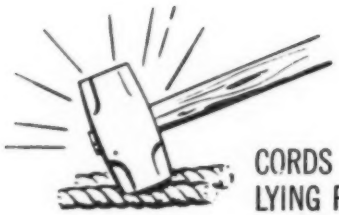
Enter 69 on card, page 255

ROYAL CORD AIR HOSE

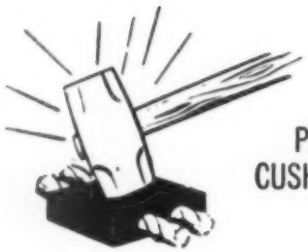
WHICH HOSE CONSTRUCTION CAN TAKE THE BEATING?



CORDS CROSSED DIAGONALLY? (as in braided hose)



CORDS LYING PARALLEL?



OR

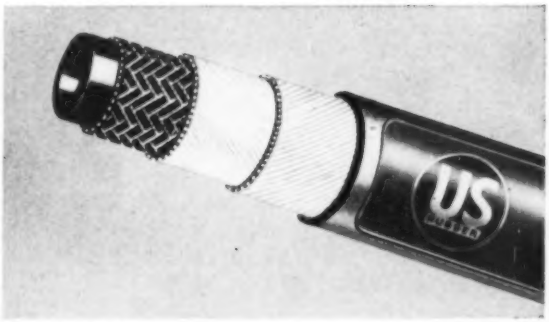
PARALLEL CORDS CUSHIONED IN RUBBER

as in U. S. Royal Cord Air Hose?

Yes, the exclusive "U. S." development—parallel cords cushioned in rubber can take and *do* take the *most* pounding. Observe how the cords run parallel in each of the two pressure-resisting plies; there is no crossing as in conventional braided hose. Each ply is separated by a layer of rubber—each cord is cushioned in rubber. This means there can be no friction created between cords, and therefore no chance of any shearing within the carcass.*

A hose with spiral plies is *always* stronger, because more strands can be used throughout the entire hose length than can be used in other constructions. *U. S. Royal Cord Air Hose has the same construction as that of a tire.* This is the exclusive quality you find under its cover.

The exclusive and outstanding features you get in U. S. Royal Cord Air Hose constitute one of the main reasons why



U. S. Rubber is the largest manufacturer of the widest range of industrial rubber products serving industry.

• • •

When you think of rubber, think of your "U. S." Distributor. He's your best on-the-spot source of technical aid, quick delivery and quality industrial rubber products.

**This same exclusive cord construction is also built into "U.S." water, steam, dock and fire hose.*

Mechanical Goods Division

United States Rubber

WORLD'S LARGEST MANUFACTURER OF INDUSTRIAL RUBBER PRODUCTS

Rockefeller Center, New York 20, N.Y. In Canada: Dominion Rubber Company, Ltd.

The Editor's Page

A New Era for the Cement Industry

THE year 1959 might be regarded as marking the transition from one memorable era of the cement industry to a new and probably even more exciting one. The industry has just gone through a hectic five-year period of expansion, when more new productive capacity was built than ever before in its history. This emphasis on expansion is gradually being shifted toward greater plant efficiency, a more uniform product, and lower production costs through the modernization of obsolete departments of existing plants. There are indications also that, coupled with this, there will be many new and startling developments in methods and equipment and in automatic control.

The records show that the cement industry in five years increased its capacity from 294,000,000 bbl. in 1954 to about 400,000,000 bbl. at the end of 1958. These figures do not, however, give a true picture of the actual capacity installed during those years since so much of this replaced existing obsolete facilities. According to our records, a total capacity of about 130,000,000 bbl. was actually installed during this period.

There is no indication of any important slowdown of expenditures for expansion and improvement of existing facilities. Our January, 1958, review showed that in 1959 about 24,000,000 bbl. of capacity would be added. Since January, plans have been announced for several large programs scheduled for completion in 1960. It is also evident that an increasingly larger percentage of expenditures is going for more elaborate control methods and equipment.

Cement producers, in general seem to be fully aware of what the industry must do to keep and improve its position in the building field. Largely due to the cement shortages of recent years, it has suffered some competitive losses to other building materials, some of which may never be fully regained; and it may suffer other losses. Every effort must be made to regain these advantages and also to find new markets, if the industry is to continue to grow.

One of the most serious problems faced by the cement industry, according to its leaders, is the lack of uniformity in its product. This is not a matter of quality, but of fluctuation in the amount of excess above specification requirements. This fluctuation must be controlled within closer limits if concrete is to be accepted as a uniform manufactured product and extend its use in such advanced products as prestressed concrete, thin shell construction, and other future highly refined applications.

Uniformity in the quality of cement is dependent upon many things, beginning with the raw materials and progressing through the manufacturing process to the final storage and loading for shipment. A uniform manufactured product can be obtained only if every step in the process is under full and accurate control. The major step, of course, is in the blending of the raw materials, and it is here that the industry is now concentrating its attention most heavily. A feature of this issue is an article on a system just completed which is the last word in the control of dry raw material blending. Similar improvement in other steps in the manufacturing process would put cement in a completely new category and in a vastly better competitive position.

Walter E. Trauffer

AMMONIUM NITRATE

Their PROPERTIES *and*

By BILL AMMONS
Oak Ridge, Tenn.

Ammonium nitrate was used in making record blasts to bring down fill material for the new Salt Lake crossover. These photos show a shot during and after a blast.

AMMONIUM nitrate has become increasingly popular through the years as the work-horse of heavy production explosives. The comparatively new adaptation of using diesel fuel oil as the hydrocarbon additive, once the powder had been "prilled" into small globes, has produced the lowest-priced explosive on the market today. Improvement has also been achieved in the detonating rate of dynamite grades by a crystallizing process. A substantially higher detonation rate has been attained for that type of material, plus added reliability in propagation.

Pre-packaged mixtures of ammonium nitrate blasting agents such as the Dynatex grades show excellent performance in quarrying and open-pit operation. Their use permits increasing the spacings between holes and very substantial reductions in the overall costs of blasting, as compared to prill/fuel oil mixtures. The new blasting agents can be furnished in highly water-resistant types for general application in the package. Optimum results are obtained when the powder is poured into the bore hole to load with the minimum of effort to achieve maximum load den-

Pouring diesel fuel oil into a bag of prilled ammonium nitrate on the job. In the premixed product this addition is made under controlled conditions.

POWDERS — PERFORMANCE

sity and consequently maximum bore-hole pressure.

The amount of energy produced by a balanced mixture of ammonium nitrate and carbonaceous fuel is about 75-80 percent of that produced by nitroglycerin. Ammonium nitrate powders have seen use for about 50 years. Usually only enough nitroglycerin was used to provide the required sensitivity, water resistance, density, and detonation velocity. One manufacturer used nitro starch as a substitute for nitroglycerin. Blasters loved it because it was nontoxic; but it did have the fault of not breaking fully into the hole sockets when small-diameter drills were used to bottom a hole.

Introduction of the nitrocarbonitrates (NCN) in the form of Nitramon (1)* about 1935 brought into use blasting agents which required a booster in addition to caps and Primacord. A metal can was used to provide water resistance. However, there has also been extensive production of non-nitroglycerin and NCN powders in other types of packages for use where water conditions are not too severe.

Use of churn drills for most blast holes in quarrying and open-pit methods of blasting generally meant that the resulting holes had several feet of water in the bottom. Consequently, the bottom part of the load required explosive compositions with some degree of water resistance. Nevertheless, free-flowing bag powders were used extensively in some areas. These had over 80 percent of ammonium nitrate and minimum quantities of nitroglycerin and gave excellent results.

With the introduction of suitable rotary drills which produced dry holes, the need for water-resistant compositions was greatly reduced. At the same time, prilled ammonium nitrate became available in large quantities at a low price. The large particle size of the prills and the resulting insensitiveness of the product resulting when the prills were mixed with carbon black, coupled with relatively low loading densities considerably restricted the value and utility of such compositions.

However, the low density of the individual prill-grains made them somewhat porous, and it was discovered that they then absorbed just about the right amount of fuel oil or diesel oil to give an oxygen-balanced mixture. This resulted in an intimate combination of fuel oil and ammonium nitrate which could be detonated fairly readily, especially when it was confined in boreholes, and particularly in those of larger diameters. Thus, effects were attained which had been achieved before only by using finely ground ammonium nitrate, and the product was also quite free-flowing.

With the achievement of this useful combination of circumstances, the stage was set for the production of blasting agents at minimum cost to the consumer, as evidenced by numerous publications.

However, there are some drawbacks: the low density of the prills, which is not entirely counterbalanced by pouring the prills into the holes; poor water resistance of the prill-fuel oil combinations; and inconveniences involved in mixing one's own powders.

Properties of Ammonium Nitrate Blasting Agents

It developed that there were definite advantages in the use of premixed and packaged compositions. Hence a series of premixed blasting agents were introduced by several explosives manufacturers; these are based largely on the dynamite types of grained ammonium nitrate. In this part of our paper the results of our investigations on the properties of our premixed formulations will be given, in comparison with those of prills and fuel oil.

Energy-wise there is little difference between premixed and prill-fuel

*Numbers in parenthesis refer to sources listed at the end of this article.

oil compositions. It is well known that mixtures of ammonium nitrate and carbonaceous ingredients balanced to oxidize the carbon to CO_2 and the hydrogen to water all give about the same amount of energy on a weight basis. There are some differences depending on the fuel, but these differences are small. In addition to the energy produced per pound, the density of loading which affects the energy produced per foot of hole, the detonation velocity, and water resistance are also important.

Our work shows that the use of the finer dynamite grades of ammonium nitrate generally give higher loading densities and higher detonation velocities than prills. Also, they can be formulated to give surprising degrees of water resistance.

As a matter of interest, photomicrographs showing various dynamite grades of ammonium nitrate, in comparison with prills, appear in Figure 1.

Because of the nature of detonation in ammonium nitrate compositions, particle size of ingredients, diameter of charge, and degree of confinement have very substantial effects on detonation velocity. The density of loading also has an effect, and higher loading densities can obviously be obtained by pouring a given free-flowing powder into a hole than by loading it in a package.

Table I shows idealized loading densities in terms of powder per foot of hole for poured *vs.* cartridged powders.

During the last several years we have had extensive experience with pre-packaged combinations of the conventional grained ammonium nitrate mixed with fuel oil and other ingredients. It has been our experience that we can get added flexibility in the way of density of loading, better sensitiveness, and where needed, excellent water resistance. The combinations can be furnished

TABLE I

Poured vs. Cartridge Powders, 6" Holes

Poured		Cartridge (5½" Dia.)	
Sp. Gr.	Lb./Ft.	Sp. Gr. of Cartridge	Lb./Ft.
0.8	9.8	0.8	6.7
0.9	11.0	0.9	7.5
1.0	12.2	1.0	8.3
1.1	13.4	1.1	9.1
1.2	14.7	1.2	10.0
		1.3	10.8
		1.4	11.6
		1.5	12.5

in bags for pouring down the holes, and it can be packaged in conventional cartridges with lowering tapes for convenient handling and loading in holes.

There has been a great deal written on the subject of the various "do-it-yourself" compositions like prills and carbon black and prills and fuel oil. It is rather obvious that these compositions, when properly primed, produce about the amount of power one would expect from experience with ammonium nitrate dynamites. It has also been quite well demonstrated by various investigators that when these compositions are balanced for combustion to carbon dioxide and water vapor, the greatest strength is obtained—however, with a fair degree of leeway on either side of the balanced mixture. This fact simply confirms what has always been taken for granted by explosives manufacturers.

Figure 2 shows a series of detonation rates that were run on mixtures of ammonium nitrate with fuel oil. These were loaded into 3-in. diameter steel pipes, and the detonation rates were measured with a Potter counter chronograph. The highest rates were obtained with the finer grades of grained ammonium nitrate, and the lowest with a coarse grade of grained ammonium nitrate and prills. These latter two differ only slightly.

Figure 3 shows the substantial effect of diameter on detonation rate of prill and fuel oil compositions. In one case the mixture was fired in 3-in. diameter pipe and in the other in a 6¼-in. diameter borehole.

Figure 4 gives data for one of our premix compositions which was fired in a paper cartridge *unconfined*. These rates do not differ very much from those of prill-fuel oil combinations fired under confinement, as

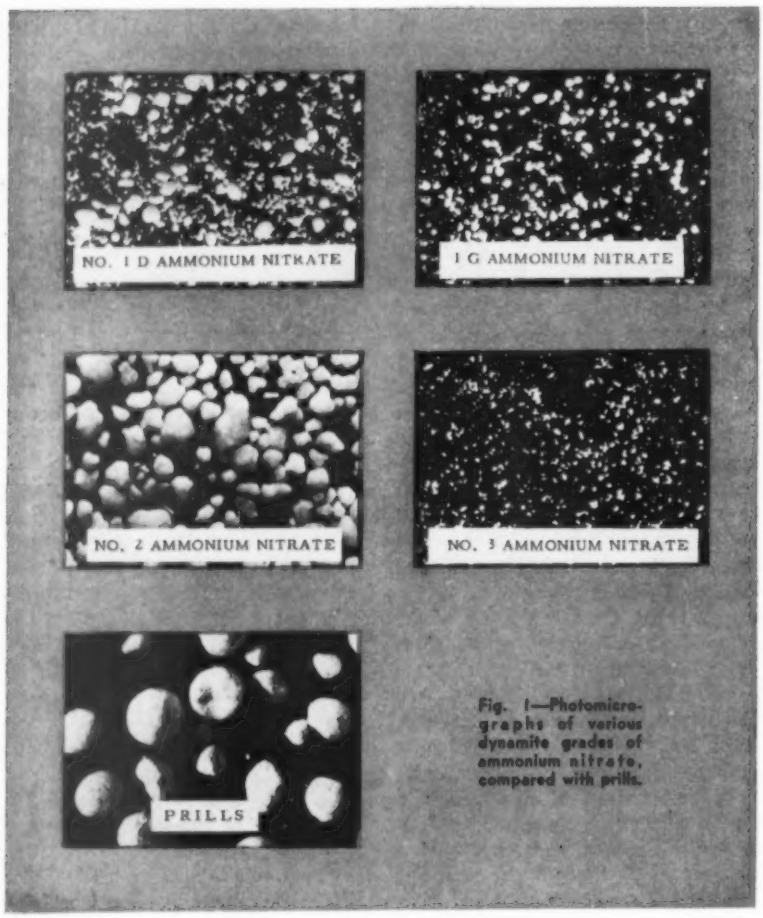


Fig. 1—Photomicrographs of various dynamite grades of ammonium nitrate, compared with prills.

shown in Figure 5. By and large, the dynamite grade ammonium nitrate-fuel oil combinations give substantial improvement in detonation rate, as compared to prills and fuel oil. For example, with premixed explosives, rates as high as 5,500 meters per second have been obtained in boreholes and 4,500 meters per second in 5-in. pipes. Just by way of example, the density of loading in a 6-in. diameter hole corresponds roughly as follows:

With prills and fuel oil—about 9-10 lb. per ft.

With premix D—about 10 lb. per ft.

With premix C—about 11 lb. per ft.

With premix B—about 12 lb. per ft.

These are for charges poured into the hole. By tamping during loading, the loading density of premix B can be increased to 13 to 14 lb. per ft. It is evident that the plant-mixed powders give detonation velocities either equal to or superior to those for prills-and-fuel-oil coupled with substantially larger loading densities which permit greater spacings between holes or the use of smaller diameter holes.

As far as water resistance is concerned, premix B-WR has been successfully shot after five or six days under 5 ft. of water and after several hours under 40 ft. of water. For this purpose, it is preferable to use the usual 23G container. However, if the water is blown or pumped from the hole first, this powder may be poured down the hole and can be expected to remain reasonably dry even if more water comes into the hole.

In the following section some of the advantages found in shooting the premix compositions under various conditions will be presented.

Performance

The field performance of the plant-mixed type of blasting agents can be considered from two viewpoints: namely, powder poured loose into the borehole and that packaged as cartridges in fiber drums, or polyethylene and burlap laminate bags.

One condition that definitely determines the package requirement is the presence of water in the borehole. Of all the packages, the fiber

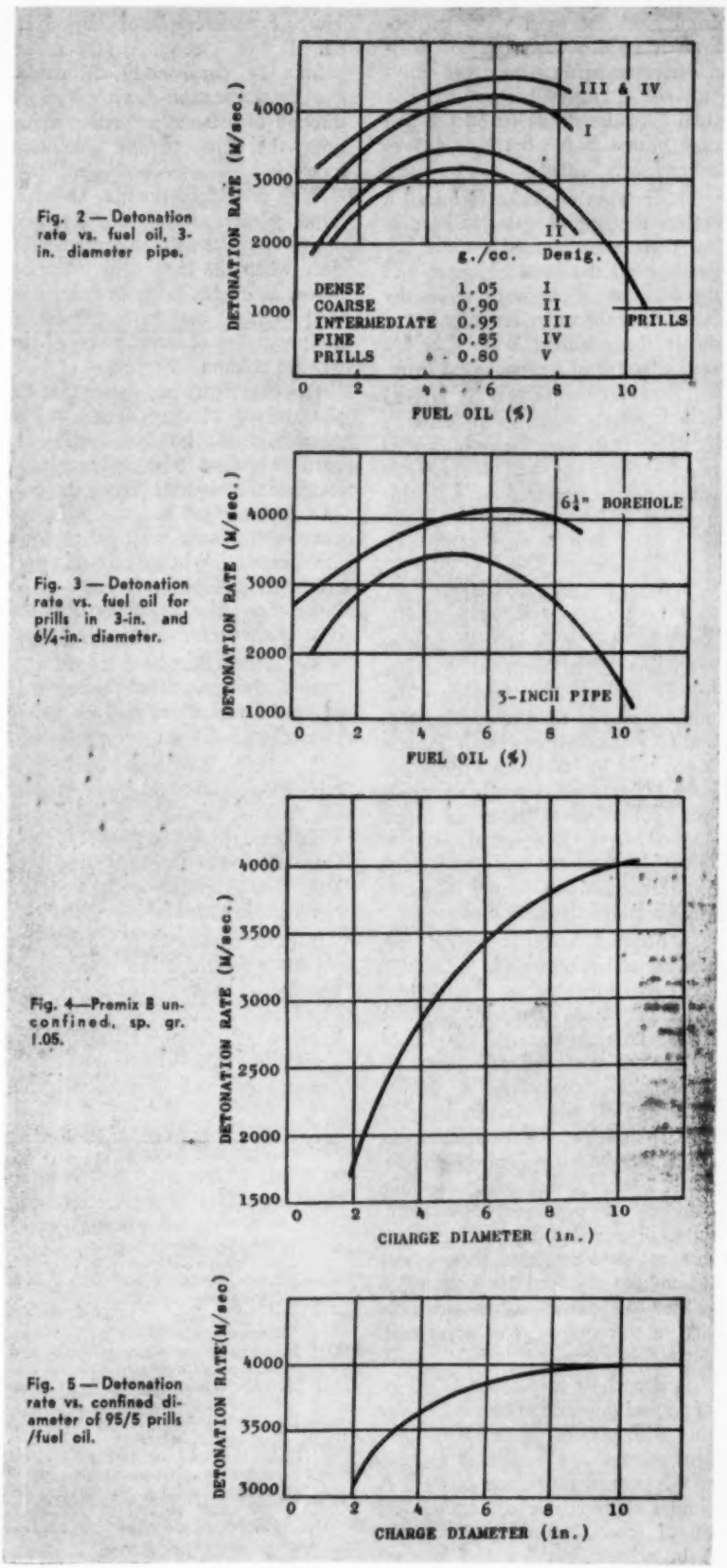


Fig. 2 — Detonation rate vs. fuel oil, 3-in. diameter pipe.

Fig. 3 — Detonation rate vs. fuel oil for prills in 3-in. and 6¼-in. diameter.

Fig. 4—Premix B unconfined, sp. gr. 1.05.

Fig. 5 — Detonation rate vs. confined diameter of 95/5 prills /fuel oil.

drum gives the most water protection; it is also preferred for horizontal hole loading over the polyethylene or burlap because the less rigid cartridge tends to buckle and may bridge in the borehole before being finally seated.

Other types of packages afford a certain amount of water resistance, but their effectiveness is more dependent on the head of water and the duration of exposure. With the addition of the water-resistant ingredients the resulting WR types are very effective in the packaged form.

These WR types can be poured in a borehole with damp walls or in holes that have been blown or pumped dry and will successfully withstand the penetration of returning water. However, they should not be poured into a hole containing standing water.

Premixed blasting agents have been used successfully in diameters down to 2½ in. in column lengths exceeding 20 ft., with but a single primer in the hole bottom. The initiator was an electric blasting cap, and no Primacord was used. Premix is sensitive to 100-grain Primacord; but for consistent, dependable results we recommend a primer of larger diameter over a long, small-diameter initiator. In fact, best results are obtained when the primer diameter approximates the hole diameter.

A question asked is: "What percentage of primer should be used?" Actually, a percentage figure does not mean much. Take for example a deep hole containing 1,000 lb. of 60 percent extra dynamite, or some cap-sensitive explosive. A primer consisting of two electric blasting caps is sufficient for detonation, yet percentage-wise they are negligible. On the other hand, when the hole contains an insensitive mixture, especially one that may contain areas that are less sensitive than others throughout the powder column, a primer (or primers) of considerable size are required for consistent, dependable results.

A deep hole containing 1,000 lb. of poured premix can be consistently shot with a 5-lb. primer of 60 percent strength. This figures roughly to 0.5 percent for primer charge. A similar shorter hole containing 100 lb. of premix would still use the 5-lb. primer, but for a 5 percent figure. Primers can be of many sizes, but all that is required is that the premix be consistently detonated, and the detonation wave will carry through a distance exceeding many times the depth of any hole used today.

With cartridged premix, no additional primers are required throughout the powder column, except possibly when the cartridges are used in wet or muddy holes or holes that tend to ravel and cave, presenting the possibility of interruption of the powder column.

Our experience has shown that the plant-mixed blasting agents, when poured in the borehole, will outperform prilled ammonium nitrate and fuel oil mixtures. When the premix is cartridged and the prills are poured, the latter may out-perform the premix. When both mixtures are packaged, the performance is in favor of premix, especially from the density viewpoint.

We believe that there are two reasons for the exceptional performance of plant-mixed explosives when poured:

1. The higher density of the premix allows more weight of powder per foot of borehole and therefore more energy per foot of borehole than the bulky fertilizer grades of ammonium nitrate, with a corresponding increase in energy.

2. The annular air space that surrounds a cartridge is eliminated by pouring. Upon detonation, the shock effects due to the detonation pressure and the effect of expanding gases are imparted immediately to the adjacent rock to a much higher degree than is the case when these effects are cushioned by an annular air space.

Dr. W. F. Brown (2) has presented data showing the ratio of initial pressures in the surrounding media to pressures in the explosive for various explosives.

It is interesting to note that in metals, rock, and various media the ratio is around 1.0 or slightly greater. However, when the surrounding medium is water, the ratio drops to around 0.75; and when the surrounding medium is air, the ratio drops to 0.003. This suggests an attenuating effect by an air space upon the initial pressure transmitted to the borehole wall, and indicates the importance of obtaining a good coupling between the explosive and the surrounding rock.

Dr. Brown (3) says, relative to detonation velocities and confinement, "It is undoubtedly true that many of the explosives used in blasting do not detonate at their maximum rate in a shot hole, because if there is an appreciable air space between the charge and the wall of the hole, even heavy rock burden does not furnish as good confinement, as far as controlling rate is concerned, as might be the case for a thin metal tube under conditions of perfect contact. To obtain the most effect from a blasting explosive, one should use it under conditions where its ideal detonation rate is approximately realized. . . . It is also important that the coupling between the borehole and the explosive be very good. This coupling can be maximized by tamping the explosive

TABLE II

	Premix B	Prills and Fuel Oil
Average spacing (feet)	26.1	19.6
Percentage increase	33%	—
Average burden (feet)	24.7	22.2
Percentage increase	11%	—
Average burden ft. of borehole (cu. yd.)	23.9	16.1
Percentage increase	48%	—
Loading factor (lb. powder/cu. yd.)	0.45	0.51
Percentage decrease	–12%	—
Average loading time/hole (minutes)	3.46	4.88
Percentage decrease	29%	—
Drilling cost/cu. yd. (cents)	4.18	6.20
Percentage decrease	33%	—
Labor cost/cu. yd. (cents)	0.04	0.11
Equipment, operator cost/cu. yd. (cents)	0.07	0.10
Cost/cu. yd.: labor, equipment, drilling (excluding powder) (cents)	4.29	6.41
Percentage decrease	33%	—

cartridge, by using a free-pouring explosive to fill voids, by using a liquid explosive, or a combination of these procedures."

Dr. Melvin Cook (4) has expressed similar convictions about the effect of an annular space. "One advantage of the use of AN/fuel oil mixtures simply poured into the borehole is that they fill the borehole completely. While this is also possible with dynamites, one does not always take advantage of the higher pressure achieved by filling completely the borehole." He also points out the sharply adverse influence of free space in the borehole on the peak pressure.

Complete filling of the borehole, with the coupling obtained, along with the relatively inexpensive cost of prill mixtures, comprises the secret of their success. The same increase in blasting performance can also be obtained with other explosives and mixtures, when poured, in cases where greater initial pressures, higher detonation rates, and higher energies exist.

It is our experience that use of the plant-mixed powders makes it possible to increase considerably the spacings and burdens normally used for prill shots. This results in more tons or yards of rock per foot of borehole, which reduces the drilling cost; and by using a smaller hole, drill savings can be realized.

We have shown savings in the use of premixed blasting agents over field-compounded prilled ammonium nitrate fuel oil mixtures, if the overall cost picture is compared. (Overall cost here means the drilling, explosive, and excavation cost — not the cost of the explosive alone.)

A test shot was divided into two sections, premix B on one side and prills on the other. The prill side normally uses spacings and burdens of about 20 by 21. For the premix part of the shot, they were stretched out to approximately 26 by 25. The loading factor for prill shots was about 0.51 lb. per cu. yd., whereas the premix loading factor was reduced about 10 percent to 0.45.

Table II compares the two sections of the shot with respect to cost.

The equipment consisted of a Michigan loader, which was used by a single operator to stem the holes and also to move the fuel oil tank around the job for the prill oiling.

A second shot was made in similar banded ore and rock material, but both sections of the shot were on essentially the same spacing. The spacings and burdens were increased over those normally used, nominally to 27 by 27 ft. from 24 by 27 ft. Table III compares the costs of the two sections.

This second shot did not have the oiling tank, but labor time was expended by the slow, laborious method of pouring the oil into the open prill bags. This shot was essentially on the same spacing and burden as the prills, a condition which is definitely not desirable as any powder with increased blasting energy should be used and compared on increased spacings and burdens.

In both these shots the fragmentation and displacement were visibly increased by the use of premix B. According to shovel operators, the digging was much better; however, actual production figures were not recorded.

By way of further example, in an open-pit nonferrous metal mine a 25 to 50 percent increase in tons/foot of drill hole and 15 to 20 percent increase in tons/lb. of explosive was realized using premix over field-compounded prill mixtures.

A granite quarry increased shovel production per hour 35 percent, decreased secondary blasting 50 percent, and decreased blasting labor cost 25 percent by switching to premix from prills.

An open-pit iron mine increased the cu. yd./ft. of drill hole more than 40 percent as a result of 33 percent increase in spacing and 11 percent increase in burden, along with a decrease in the actual powder factor. Whereas the premix cost was 22 percent more than the prill mixture, the decreases in drilling and labor resulted in a 14 percent decrease in drilling and blasting cost over prills, not to mention the increased shovel production, which was obvious but not measured.

There have been many other reports of increased fragmentation and overall savings resulting from the use of a well balanced, relatively sensitive, uniformly mixed blasting agent over field-compounded mixtures of prilled ammonium nitrate and fuel oil mixtures.

TABLE III

	Premix B	Prills
Average depth hole (feet)	50.9	50.4
Average spacing (feet)	26.3	27.9
Average burden (feet)	33.5	28.5
Loading factor. Lb. powder/cu. yd.	0.31	0.41
Percentage decrease	25%	—
Average cu. yd. burden/ft. of bore hole (cu. yd.)	32.6	29.4
Percentage increase	11%	—
Drilling cost per cu. yd. (cents)	2.74	3.02
Labor cost/cu. yd. (cents)	0.02	0.04
Total cost/cu. yd.: labor, drilling (excluding powder) (cents)	2.76	3.06
Percentage decrease	9.0%	—

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1. W. E. Kirst, J. W. McCoy, C. A. Woodbury, U.S. Patent No. 1,992,216, February 26, 1935.
W. E. Kirst, C. A. Woodbury, U.S. Patent No. 1,992,217, February 26, 1935.

2. F. W. Brown—*Determination of Basic Performance Properties of Blasting Explosives* presented at First Annual Symposium on Rock Mechanics—Colorado School of Mines, April, 1956.

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4. M. A. Cook—*Large Diameter Blasting with High Ammonium Nitrate, Non-nitroglycerin Explosives,* presented at the Third Annual Symposium on Mining Research, Missouri School of Mines, November 14-15, 1957, and Proceedings of the Sixth Annual Drilling and Blasting Symposium, University of Minnesota, October 11-13, 1956, p. 31.

Fifty-six veteran employees of the Alsen, N. Y., plant of the North American Cement Corporation have been honored for their safety record. A total of more than 3,000,000 working hours without an accident was recognized by awarding each of the men with a certificate, a pin, and a decal for his safety helmet.

N.C.L.I. Board Approves Merger Plan with N.A.L.I.

Thomas E. Lalley, center (Bradford Hills Quarry, Inc.), presided over the board sessions. With him here are E. B. Snead, left (Texas Crushed Stone Co.), a member of the board and of the executive committee; and Robert M. Koch, right, executive vice-president, N.C.L.I.

By BUREN C. HEROD

ANOTHER ON THE SPOT REPORT

IN one of the most interesting mid-year sessions on the record of this young organization, the board of directors of the National Crushed Limestone Institute met on June 8-9 at the Sheraton-Blackstone Hotel, Chicago. A proposal developed in the interest of increasing operating efficiency, prestige, and service was approved for referendum to the entire membership.

The proposal concerns a merger with the National Agricultural Limestone Institute, to form a new corporation—the National Limestone Institute. This group would consist of an agricultural limestone division and a crushed stone division, each with its own board of directors. However, one group of top officers and one executive committee would be common to both.

This proposal, which has been under study for about a year by special committees representing the two associations, was accepted by the board members present, with no dissenting votes. The measure is now being presented to the N.C.L.I. membership, who will vote on it by mail ballot.

During the general session, which was presided over by Thomas E. Lalley, N.C.L.I. president (Bradford Hills Quarry, Inc., East Petersburg, Pa.), reports of other standing committees were presented on the matters of convention arrangements, finance, legislation, public relations, tax, specifications, etc.

As reported by Charles S. Bryan (Bryan Rock Products, Inc., Shakopee, Minn.), chairman of the convention arrangements committee, the program for the 1960 annual convention will incorporate joint sessions of the two divisions, as well as possible simultaneous meetings designed around individual division interests — unless the proposed merger is rejected by the general membership. The convention will be held from January 17 to 20 at the Hotel Statler, Washington, D. C. It is also recommended that the 1960 mid-year board meeting be held in Chicago at the Sheraton-Blackstone hotel on June 6 and 7.

The recommendations of the legislative, public relations, and tax committee, presented by chairman H. C. Wolfe (Wyandot Dolomite, Inc., Carey, Ohio) sparked considerable floor discussion on the matter of the highway program. The group opposes inclusion of toll roads in various states in the Interstate System at this time. As recommended by the committee and approved by the board members, the association should voice official objection to such a move, not only because it would reduce funds which would otherwise go toward new construction, but also because it would probably tend to further complicate an already complex problem of financing the program.

Mr. Lalley noted that the attention of the specifications committee has been directed toward the problem of moisture absorbtion reported by many members. Study is being made of the possibility of research on this point, and continuing investigations in the area of pavement slipperiness. He also indicated that the group can now avail itself of engineering service from the Washington office since an engineer, W. Vicinus, recently joined the staff.

In his mid-year report, Robert M. Koch, executive vice-president, reviewed the established policies and objectives of this Institute. Among these are the proposition that additional Interstate miles contemplated for construction at the termination of the present highway program should be incorporated now in lieu of becoming a part of a series of separate programs. A continuous interrupted effort would prove more efficient and serve the nation's needs best, it was emphasized. An increase in the primary and secondary road systems is also a logical move at this time, Mr. Koch remarked.

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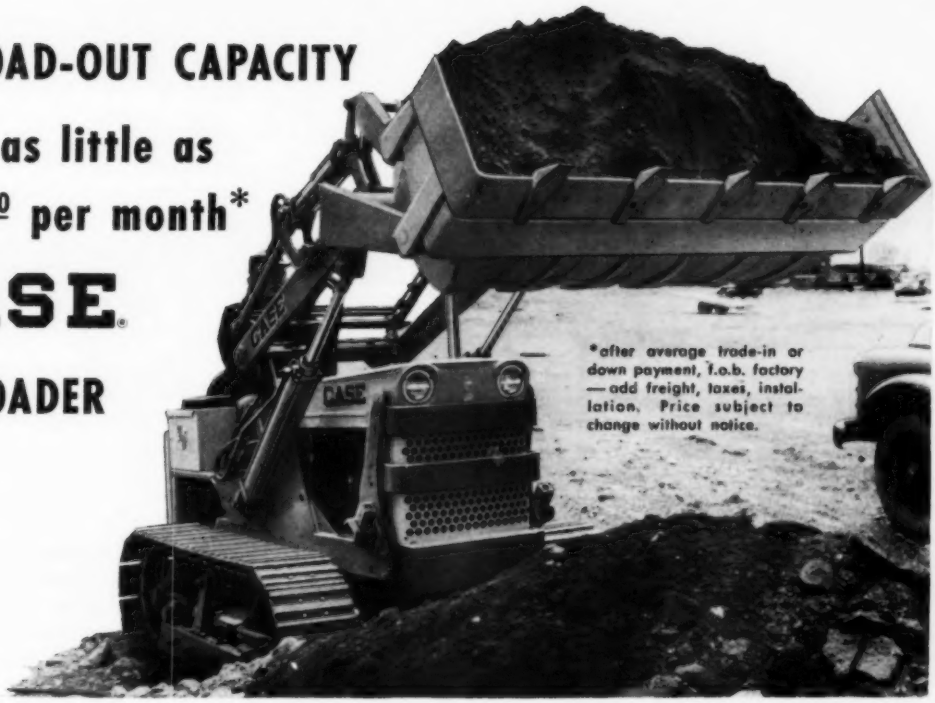

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CTU-L-136

Well Engineered Electric Power

Part I

By T. H. ANDERSON

About the Author

A graduate of the University of Kentucky with a degree in electrical engineering, Mr. Anderson has been associated with the Louden County Cooperative for the last 11 years, and has also been serving quarry and mine operators in the area in a consulting capacity.

ADEQUATE design and construction of a.c. high potential, primary service to quarries and mines, and the effect on personnel safety, economy, and continuity of operation of draglines, shovels, drills, and augers cannot be overlooked. All the factors that may have a bearing on the performance and initial installation cost, plus maintenance must be well considered during the planning stages.

Obviously the number, size, and type of equipment must be considered first in determining load requirements. By shovel we mean both shovel and dragline types. Power requirements are the same, since the same type of equipment drives them.

In general, shovel drives are of the load-limiting type, and with the exception of the smaller sizes, they use variable-voltage drives with a separate d.c. generator for all of the three main motions executed—hoist, swing, and crowd. These highly efficient generators are usually designed to have a drooping voltampere characteristic which automatically limits the peak kilowatt output to a reasonable value. (Figure 1) All this means that the maximum demands for the equipment are readily estimated.

Substation Equipment

The voltage of the primary will vary with the whims of the power company, which is guided by a host of factors, among them the length of the line, the load, and the age of the transformers connected. Us-

Fig. 1—Transformer rating required for power supply to shovels.

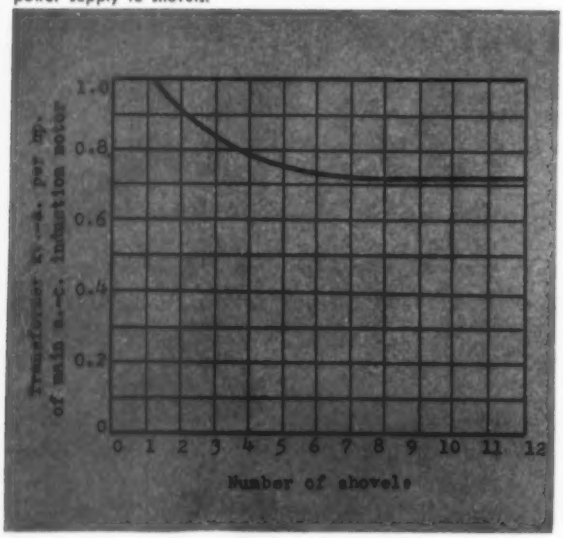
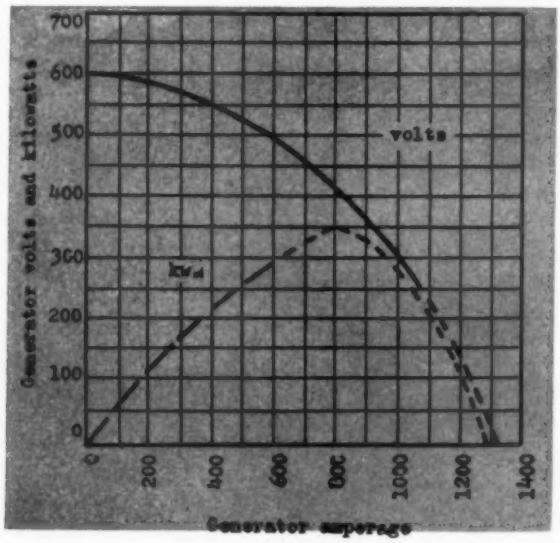


Fig. 1a—Volt-ampere and kilowatt characteristics of variable-voltage shovel generator.



Distribution for Quarries and Mines

Illustrative of the complexities in equipment and power distribution in modern quarrying is this general view of the T.V.A.'s Wautauga Dam quarry site.

ually this is of no moment to the customer as long as the voltage remains reasonably constant and outages are infrequent. However, the voltage for his equipment is determined by the customer, and his decision is controlled by several factors.

The size of the mine or quarry determines the size and number of transformers, circuit breakers, and lightning arresters assembled as substations. Added to the above may be rectifying equipment to convert a.c. to d.c. for that popular type of drive. This change may be made by the more prosaic motor-generator set, the rotary convertor, or the more modern mercury rectifier.

Distribution System

A decision as to the voltage best adapted to the new installation will depend on such factors as: ratings of motors to be energized, disposition of power loads in the mine or quarry, location of substations and corresponding distribution distances, and form of construction of transmission lines.

The smallest electric shovels, particularly those using friction clutches and single-motor drives with ratings up to 125 hp. frequently use 440-volt motors. At this voltage, however, power can be transmitted only very short distances with acceptable voltage drop and power peak demands—unless one goes to great expense to enlarge the copper to overcome the latter handicap.

Oversize copper may be necessary in cables over 1,000 ft. long or longer. Little or no overhead line from the transformers will be permissible.

Variable-voltage shovels in the mining and quarry class, including units with main a.c. motor ratings from 125 to 350 hp. ordinarily use 2,200-volt or 3810-volt motors. The higher voltage will often prove preferable for all sizes if the distribution circuits are to be extensive.

Stripping shovels having main a.c. motors of 600 hp. and larger ratings are generally powered at 3,810 volts or slightly higher voltage.

Standard voltage ratings of transformers for supply of such distribution systems are approximately 10 percent above the motor voltages noted above.

Transformer Ratings Needed

Because of the nature of the work, individual shovels present extremely variable loads. During each operating cycle, which may be as short as 15 seconds in duration for small loading shovels, and up to 50 or 60 seconds for a larger stripping machine, the power demand may exceed the full-load rating of main a.c. motor for 30 percent or more of the time, and in each cycle there may be momentary peaks of the order of 200 percent or more of full-load input to the motor.

In steady digging, the r.m.s. loading of the main a.c. induction motor may approach its continuous ratings. Where a single shovel is supplied from the substation, the r.m.s. current loading of the transformers is the same as that of the a.c. motor on the shovel; and as the a.c. mine motors used in this service are of high efficiency and power factor—generally averaging better than 90 percent at full load—the minimum rating of the transformer required for supply to one shovel can be determined as shown below.

Allowing for an r.m.s. loading of the transformer equal to full-load current input to the main a.c. driving motor, and for a ratio of 2,400/

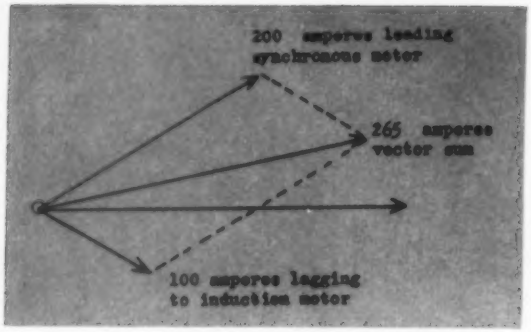


Fig. 2—Vector sum of leading and lagging power factor.

2,200 or 1.09 between standard transformer and motor voltage ratings, the continuous kv.-a. rating found by the following formula will be conservatively correct for transformers supplying a single shovel: 1.09x (hp. rating of a.-c. motor) x 0.746 kw. per hp. over 0.9 eff. x 0.9 p. f.

That is, for the supply of a single shovel, a continuous rating of 1 kv.-a. in transformers for each 1 hp. in the main a.c. induction motor rating will be adequate.

Since the operating and peak loads will not all coincide, if a number of shovels are operated from the same substation, the ratio of peak to average demand on the transformers is less than on the individual shovel feeders. The more numerous the shovels in operation, the more nearly uniform becomes their combined demand, and the nearer the transformer loading approaches the sum of the average power demands of the individual shovels. The average demand of the shovel in steady digging will ordinarily be not more than 70 percent of full-load input to the main a.c. induction motor. For large numbers of shovels the continuous ratings of the transformers required is given by this formula: 1.09 x 0.7 x (hp. rating of a.c. motor) x .0746 kw. per hp. over 0.9 eff. x 0.9 p.f. = 0.7 kv.-a. per hp.

That is, for suppling a large number of shovels, a continuous rating of the order of 0.7 kv.-a. in the transformers for each 1 hp. in the sum of the main a.c. motor ratings will be adequate.

Transformer Ratings

For any number of shovels, the required transformer rating may be approximated from a curve such as the one shown in Figure 1. In every case, of course, additions should be made for drills, pumps, compressors, or other auxiliary equipment supplied from the substation, and transformers of the nearest larger standard rating applied.

The transformer rating for a number of shovels, indicated by this curve, will probably be somewhat conservative, as the currents to different shovels are at various power factors and add vectorially in the combined load. The average value of the combined currents, therefore, will be less than the sum of the average current inputs to the several shovels. In many cases also allowance may be made for delays in operation of individual shovels.

It should be noted that the method of estimating transformer rating described above is for shovels using induction motors driving the main m.-g. sets, or in a small operation, the shovel itself.

The main m.-g. sets of larger shovels, in the stripping class, are nearly always driven by synchronous motors, designed for operation at 0.9 or 0.8 leading power factor at full load. When operated at constant field strength, the current input to such motors at no-load is of the order of 70 to 80 percent of the full-load current, as compared with 30 percent or less for induction motors of the designs used to drive shovel sets. As a result of this characteristic, the average current input to a synchronous motor driving the m.-g. set of a shovel in steady digging may be as high as 85 percent or more of the full-load motor current.

That is, the ratio of r.m.s. current to average current on the shovel operating cycle will be greater with synchronous motor than with induction motor drive for the main m.-g. set. The transformer for supplying shovels with synchronous m.-g. sets, therefore, needs to be somewhat larger than that required for shovels with induction motors in the m.-g. sets, as shown by Figure 1.

If the synchronous motor field strength is regulated automatically, maintaining high power factor throughout the operating cycle, Figure 1 shows the approximate size of transformer required. Allowance is made for the operating power factor if this should be different from 90 percent, the value on which the curve is based.

If shovels using synchronous motors in the m.-g. sets are operated on the same circuits with other shovels using induction drive in the m.-g. sets, or with any considerable induction motor load, the transformer loading will be somewhat less than the sum of the synchronous and

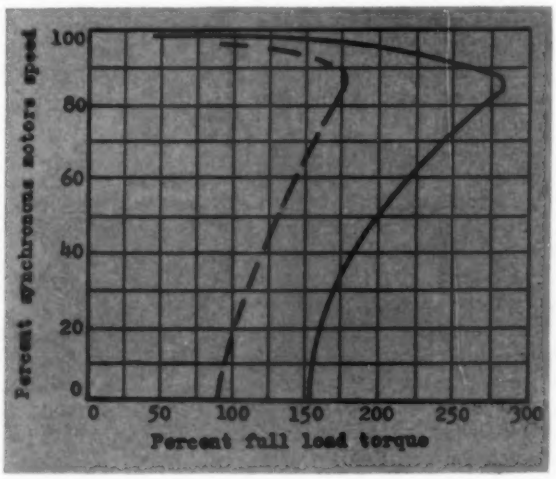


Fig. 3—Speed loss at 175 percent full load torque.

induction motor loads. This is true because the vector sum of the synchronous motor currents at leading power factor and the induction motor currents at leading power factor and the induction motor currents at lagging power factor is less than the algebraic sum as indicated in Figure 2.

A-C Voltage Regulation Affects Performance

The effect of drop in voltage delivered to the main a.c. motor on the speed and production of a shovel, and the necessity of holding as near as practicable to the rate voltage of the motor to obtain the best shovel performance, is not always fully appreciated. The effect is insidious in that it is not readily noticeable, with the rare exception of warm conductors.

Mention has been made of the dropping volt-ampere characteristics of a d.c. variable voltage shovel generator, which inherently limit the maximum output and power demand of the generator. These characteristics, at full generator field excitation and normal speed, have the full form shown in Figure 1A.

Peak Loads

With the maximum demand of each generator fixed by its design and field adjustments, the peak demand of the three shovel generators can be fairly closely estimated. One of the main requirements of the a.c. motor which drives the m.-g. set, then, is that its maximum or pull-out torque be sufficient to carry the peak loads of the generator in the heaviest service for which it was designed.

The pull-out torque of an induction motor varies as the square of the voltage applied to its terminals, and that of a synchronous motor directly with the voltage. Allowing for a reasonable variation in voltage, the a.c. motor must be designed so that at the minimum, torque will be sufficient to carry the peak loads of the shovel operating cycle.

It is generally practicable to design the power supply and distribution system for an open-pit mine so that at maximum demand on the system the voltage received by the a.c. motors of shovel equipment, at percent of rated motor voltage, and at minimum demand the voltage does not exceed 110 percent. The a.c. motors of shovel equipment, at 90 percent of rated voltage, will develop sufficient pull-out torque to carry the required peak loads, and will operate safely at 110 percent of rated motor voltage. Accordingly, for a 2,200-volt motor, the range of voltage received at the shovel should be no greater than from approximately 2,000 volts minimum to 2,400 volts maximum. For motors of other rated voltages, the maximum variation should be in the same proportion.

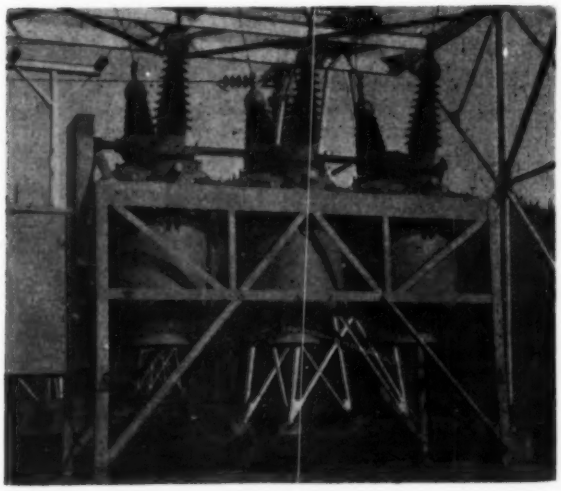
Safe Load Range

Although a shovel may operate successfully if the range of voltage variation does not exceed 20 percent of the rated voltage of the a.c. motor, and there are mines in which greater variation exists without any apparent operating difficulties, such practice encroaches upon the margin of safety and performance provided in the electrical equipment.

Although it is not readily apparent, if the a.c. motor voltage is allowed to fall too low, there is a sacrifice of shovel performance, particularly if the shovel m.-g. set is driven by an induction motor.

The speed-torque curve of the induction motor at rated voltage and frequency is of the general form shown in Figure 3. The motors driving shovel m.-g. sets, supplied with 60-cycle power, are almost always 4-pole designs, with no-load speed of 1,800 r.p.m. The full-load speed is from 1 to 2 percent less, and the drop in speed from no-load to full load is nearly uniform, or in other words on a straight line. At high over-loads the speed drop is at somewhat greater rates, and motors of the designs used in shovel equipment reach pullout torque at approximately 90 percent of the no-load speed.

(Part II of this article will appear in a subsequent issue.)



As described in the accompanying article, many factors must be considered in substation installation.

Montana Bureau of Mines Issues Revised Directory

The new 1958 *Directory of Known Mining Enterprises in Montana*, Bulletin 10, utilizes a new arrangement in the order of listings of mining properties. The mines are listed alphabetically under counties with owners and operators.

This bulletin includes a chapter on the mineral industry of Montana in 1958, a preliminary annual report prepared by K. D. Baber, G. A. Kingston, and N. S. Petersen, commodity specialists.

The 80-page bulletin is available free from the Montana Bureau of Mines and Geology, Montana School of Mines, Butte, Mont.

Wapak Sand & Gravel Company, Lima, Ohio, recently acquired the large sand and gravel plant south of Westminster previously owned by C. E. Duff & Son, Lakeview. Deposits are rated as class A high quality.

Main real estate, gravel pits, shops and offices of Fenton Construction Company, Troy, Ohio, were recently purchased by the Troy Gravel Company, owned by the Ernst Brothers of Piqua, Ohio.

Alkalis and Sulphur

By T. PALVIO

Chief Chemist
St. Lawrence Cement Company

We present — T. PALVIO

The author of this paper was born in Helsinki, Finland, and was graduated from Finland's Institute of Technology in 1959.

After serving as plant chemist with the Airam Glass Works of Helsinki for three years, he moved to Canada. He was associated with the Aluminum Company of Canada as a chemist in the main laboratory of the Arvida Works. In July, 1957, he entered the cement industry as chief chemist of the St. Lawrence Cement Company at its Clarkson plant.

He is a professional engineer and member of the American Society for Testing Materials.

A NUMBER of papers have been published on the behavior of alkalis in cement kilns, and the Portland Cement Association has done notable work in this field. (1)*

Alkali balance can readily be determined for each kiln by analyzing the raw materials, the dust loss and the finished product. However, little is known about the course of events within the kiln.

The wet process kilns of the St. Lawrence Cement Company are provided with eight sample holes in the preparation and calcining zones. These holes can be opened during operation by removing the caps. The material flows from the kiln and can be collected in a sample pail. A representative sample is taken, and the temperature is immediately measured.

The location of the sample holes and chains is shown with accompanying illustration, which also gives the analytical data concerning moisture, temperature, free lime, alkalis and sulphur. Moisture was determined at 110 deg. C., free lime with the ethylene glycol-methyl alcohol method, alkalis with the Beckman DU spectrophotometer, total sulphur gravimetrically as $BaSO_4$, and sulphide sulphur with an I_2 standard solution back-titrated with $Na_2S_2O_3$. Except for moisture and free lime, the results are based on loss free samples, *i.e.*, they are given on the clinker basis. For calculations, the loss on ignition was determined by heating at 1050 deg. C. for ½ hour. As seen in the illustration, hole No. 1 was not sampled; this was because experience has shown that the slurry here is too wet for sampling.

The results seen in the illustration show the raw mix as completely dry at the end of the chains (hole No. 4). This indicates that the last portion of the chains creates dust. St. Lawrence Cement Company uses the dust injection principle developed by Mooser (2).

The collected dust is injected into the burning zone through the flame, and the result is increased production and improved heat economy.

The total amount of dust generated may be estimated from the K_2O analysis on raw mix, returned dust, and samples from hole No. 2, the point at which no more dust generation occurs because of the high moisture content. The K_2O results based on dry materials are as follows:

Raw mix	.82 % K_2O
Return dust	4.47
Sample hole No. 2	1.68

If x = percent dust at hole No. 2, then

$.82\ (100 - x) = 4.47 \times X = 1.68 \times 100$ and $X = 23.5\%$ (approx.)

However, as a considerable amount of dust is caught by the wet chains, the actual circulating load of dust is estimated at about 4 to 8 percent of the dry raw feed.

The amount of dust at hole No. 2 may also be calculated from the results obtained on the total SO_3, which can be determined accurately.

The temperature curve shown in the illustration indicates the efficient heat transfer taking place in the dry chains. The chain section makes relatively low kiln exhaust temperatures (450 deg. F.) possible. The heat exchange improves in the slimmer calcining zone, where the gas velocity is high. However, the rate of temperature increase in the dry chains is superior.

Raw materials in Clarkson are low in sulphur, but the coal used as fuel contains about 3 percent S. The sulphide sulphur curve suggests continuous and rather uniform oxidization of sulphides within the range tested. The return dust contains about .4 percent S, but there is none present in the clinker. Apparently, the sulphides originating from coal swept into the kiln with the injected dust are deposited over the length of the kiln, while a portion escapes to the dust collection system.

About one-half of the quantity of sulphides is water-soluble.

The interesting part of the results shown in the illustration is the similarity of shapes of the K_2O and the Na_2O curves; yet the K_2O curve, having a sharper minimum, suggests a large portion of kiln dust as being caught in the wet chains. In the dryer parts of the chain section, the alkali concentration is reduced, probably because these particles are smaller and higher.

Theoretically, a reduction of al-

*Numbers in parentheses indicate references at the end of the article.

in a Dust Injection Kiln

kalis should result if the finest dust were removed from the precipitator system, or if a larger, denser, or generally "dustier" dry chain section were installed.

After the chain section the alkali content increases, suggesting a rate of dust deposition exceeding that of dusting.

In the clinker most of the alkalis appear in the form of potassium-sodium sulphate. Sulphates are harder to volatilize if alkalis are present in excess in sulphates (3). The sulphate phase may contain K_2O and Na_2O in the molecular ratio of up to 3 to 1. The rest of the alkalis are reported to form $KC_{23}S_{12}$ and NaC_8A_3 (4). The dust injected through the flame is expected to undergo better alkali volatilization by being exposed to higher flame temperatures, in addition to its movement through the burning zone in the form of clinker.

As is generally known, potassium volatilizes more readily in most cement kilns than sodium (1). This is the case in Clarkson, where the following K_2O to Na_2O weight ratios were observed:

Raw material	3.77
Clinker	2.73
Average kiln sample	4.26
Muliticlone	9.4
Electrofilter (total)	10.2
Electrofilter (comp. 3)	11.3
Stack loss	11.4

The kiln dust described above was carried out under normal operating conditions.
Operating data is given below:

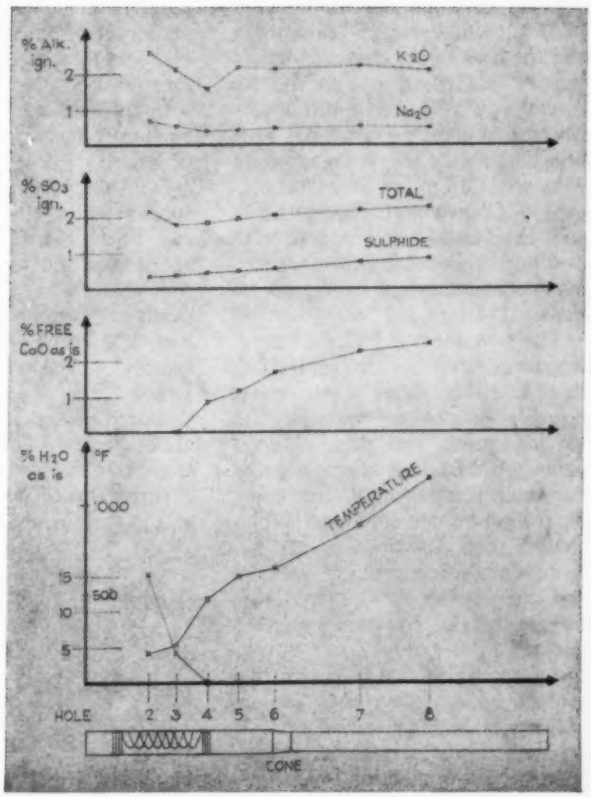
Time of test	Sept. 29, 1958 2 to 4 p.m.
Slurry water	33.8%
Residue on 200 mesh	18.1%
Production rate	1110 tons /day
Gas temp. before chains	1400 deg. F.
Oxygen in exit gas	2.7%
Kiln dimensions	402′ x 13′2″, 11′6″, 13′2″

Acknowledgment

The fine co-operation of various departments required to accomplish this work is gratefully recognized. The analytical work was performed by Mr. M. English of the Clarkson laboratory staff.

References

1. Hubert Woods, *Reduction of Alkalis in Cement Manufacture*, Portland Cement Assn. M-149.
2. H. W. Mooser, *Utilizing the Dust from Cement Kilns*, U. S. Patent 2,477,262. July 26, 1949.
3. Hubert Woods, *Rock Products*, February, 1942, Vol. 45, page 66.
4. Terry F. Newkirk, *The Alkali Phases in Portland Cement Clinker*, Proceedings of the Third International Symposium on the Chemistry of Cement. London, 1952.



Seismic

A shock wave resulting from the blow of a sledge against a steel plate travels underground to a geophone and electronic counter.

THERE would seem to be little, if any, relationship between present seismic technology and the heavy-duty tractor-mounted rippers that have been in use for several years. However, this apparent lack of common cause has been bridged with the recent development —by the Caterpillar Tractor Company—of a new procedure for rapid and inexpensive determination of overburden consolidation in quarrying and other surface mining operations.

The new method, referred to as seismic analysis, is based on the fact that sound or shock waves travel through subsurface materials at varying speeds, and along different paths. A refraction seismograph is the basic component in measuring the overall burden consolidation, including such deposit characteristics as hardness, stratification, jointing, and the degree of decomposition (weathering). In addition, the thicknesses of various strata of subsurface materials can be determined to depths exceeding 100 ft.

Despite the range of information the method provides, the only equipment needed in addition to the seismograph is an 8-lb. sledge hammer, a small steel plate, a coil of wire, and a set of data tables. The simplicity of the system also carries over into its utilization. Only two men, with the minimum of training, can perform a seismic study in a matter of hours.

With the information provided by such a study, the quarry operator can select the most efficient and economical means of removing the overburden above his reserves, *i.e.*, drilling, blasting, and shovel loading; bulldozing and pan scraper removal; or ripping and scraper removal.

Development of the method described below stemmed from the interest of Caterpillar engineers in the relationship of heavy-duty rippers to the various classes of subsurface materials. Company engineers were convinced that on many jobs the use of rippers would result in lower earth- and rock-moving costs, and consequent lower overall production costs, than would be possible with traditional methods. A study of a number of such applications indicated that the use of rippers on a production basis showed a lower unit cost on overburden removal.

Some examples of relative costs of ripping and of drilling and blasting on typical jobs listed in the table below include removal and actual ripping of the quarried material.

Note that the cost of loosening the material by ripping ranges from less than 12 percent to 60 percent of the cost of drilling and blasting. It should be further noted that these cost figures do not take into account

Location	Material	Ripping Production (CY/Hr.)	Ripping Cost (Cents/CY)	Drilling and Blasting Cost (Cents/CY)
Tulsa, Okla.	Limestone	250	7.3	17.3
Dallas, Tex.	"	350	5.2	15.1
San Francisco, Calif.	Sandstone	400	15.0	30.0
Chicago, Ill.	Limestone	460	6.5	—
Philadelphia, Pa.	"	196	11.5	19.3
Carbo, Va.	Sandstone	300	8.6	15.7
Hibbing, Minn.	Frost	90	25.0	60.0
Hibbing, Minn.	Paint Rock	350	6.1	54.5

Technique Aids Quarry Operations

subsurface strata studies indicate most economical methods for overburden removal

the expense of moving the material. In most operations, scrapers can be used to follow rippers, while shovels and trucks or wagons generally are used after blasting—which adds to the cost differential.

In view of the relative costs of ripping and blasting, Caterpillar engineers felt that present methods for determining rippability of overburden material were either inconclusive or too costly and time-consuming.

Core drills and hardness tests could provide some of the answers, but neither one nor both could completely determine rippability. Tests based on the electrical resistivity of subsurface materials were becoming more common but required considerable core drilling and highly trained, experienced personnel for accurate interpretation.

A simpler method was sought—something a user could handle with only a few days' training, and one that would be relatively inexpensive. Introduction of the refraction seismograph for measuring overall consolidation of subsurface materials provided the answer.

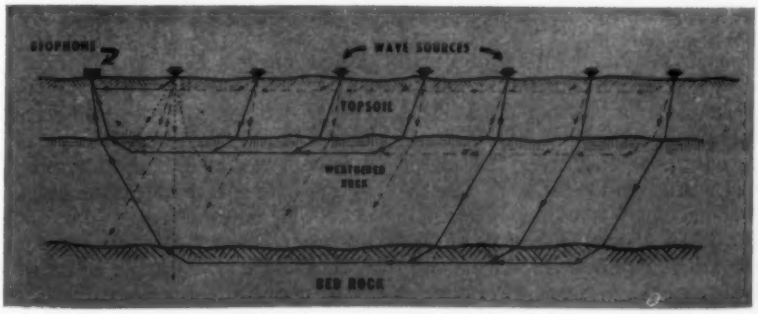
The refraction seismograph works on the principle that sound, or seismic, waves travel through subsurface materials at different speeds and along different paths. Speed of a seismic wave depends upon the consolidation of the material—the higher the consolidation, the higher the velocity. The path of a seismic wave varies with speed and also with the thickness of layers of materials having different degrees of consolidation.

In the method developed, a seismic wave is produced by striking a steel plate with a sledge hammer at various distances from a geophone receiver. The receiver is sensitive only to the first seismic wave that reaches it. Thus, either the seismic wave that travels the shortest path, or one that travels over a longer path but which includes a high velocity segment, triggers the geophone. The time interval between the hammer blow and receipt of the seismic wave at the geophone can be read directly on the instrument panel.

The solid lines in Figure 1 represent paths of the seismic waves which are detected by the geophone. Assuming, for illustration, that seismic wave velocities of the topsoil, weathered rock, and bedrock are 1,000, 3,000, and 6,000 f.p.s., respectively, it can be seen that the seismic waves traveling the longer paths can reach the geophone first. Dotted lines show the paths of seismic waves which have a longer travel time, and which consequently are not detected at the geophone.

Spacing of the seismic wave sources at 10-ft. intervals permits the construction of a graph of time *vs.* distance, as shown in Figure 2. The slopes of the various segments of the curve represent the velocities of the seismic wave.

Figure 1. Seismic waves are created by striking a steel plate at points spaced on 10-ft. intervals from the geophone receiver.



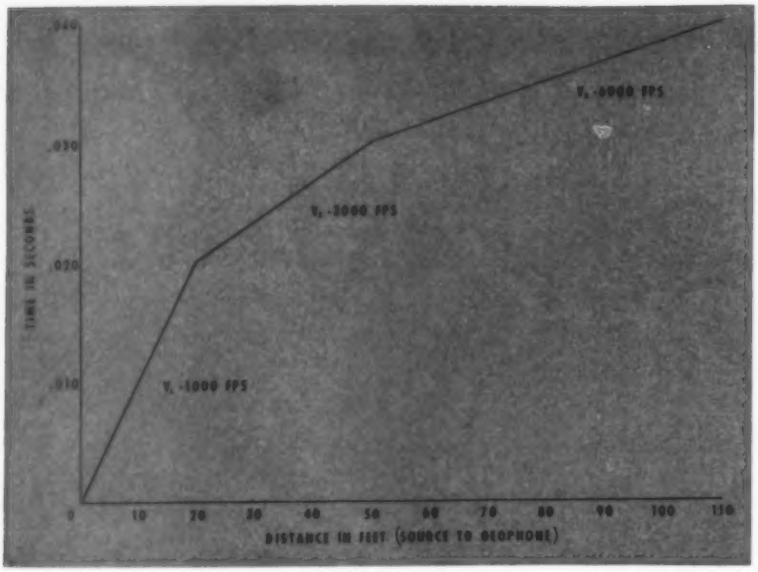


Figure 2. A plot of time (milliseconds) vs. distance (feet) illustrates the different speeds of seismic wave travel through different strata.

Velocity (V) of the seismic wave is found by the formula

$$V = \frac{D}{T}$$

where D is the distance from the plate to the geophone, and T is the time lapse.

These velocities can be used to determine rippability of subsurface materials. Caterpillar engineers recently completed an extensive program of correlating the performance of rippers with consolidation of the ripped materials, as indicated by the refraction seismograph. The range of seismic velocities for the common subsurface materials was obtained on construction and mining jobs where ripper performance was known. Over 200 tests were made in 18 states to complete this initial phase of the program.

Work has progressed to the point at which rippability of a dozen common materials can be predicted with reasonable accuracy. As more data is accumulated, evaluation of materials such as shale, sandstone, limestone, and caliche will be improved upon, and other materials will be added to the list.

Actual analysis of the materials on a job is simple. From 20 to 30 minutes are required to run each test and to determine seismic wave velocities. A comparison of the wave velocities with those obtained in the same materials on prior jobs will give a good indication of the ripper performance and production that may be expected. On the jobs in which this procedure has been followed, and in which the results have been observed, the determinations of rippability have proven exceptionally accurate, Caterpillar engineers report.

It should be noted that the materials must first be classified as to composition, such as caliche, limestone, sandstone, or shale. Physical properties of different rocks vary in respect to their rippability although velocities of sound waves through them are almost identical. Such classification usually is readily provided by a minimum amount of core drilling, observation of existing highwalls or outcroppings, or a general knowledge of area geology.

In addition to determining the degree of consolidation, or rippability, of each layer, it also is possible to determine the depth of each layer. This is an added bonus to the operator or the mining engineer who usually is very much interested in knowing how much of a particular material is under the surface. Depth is determined by a simple equation based upon the seismic wave velocities and the distance from the geophone where the velocity change occurs:

$$D = \frac{Xc}{2}\sqrt{\frac{V_2 - V_1}{V_2 + V_1}}$$

D is depth; Xc is the distance along the bottom of the graph in Figure 2 from zero to the intersection point of the line; V_1 is the velocity of the seismic wave in the upper layer; and V_2 is the velocity wave in the next lower layer. Depths of successive layers are determined in similar fashion.

The refraction seismograph, therefore, accurately determines both the consolidation or rippability of the layers of subsurface materials and the thickness of the layers as well.

The success of numerous seismic analyses conducted by Caterpillar engineers indicates that expensive and complicated methods of classifying materials for overburden removal are no longer necessary. Instead, the mine engineer or operator can now determine easily, quickly, and inexpensively, when to drill and blast, and when to rip overburden for lower costs. Thus he can put the right equipment to work for optimum job efficiency.

Practical Use of Government Statistics, a 32-page booklet published by the Small Business Administration, gives information on how to find market statistics needed for private businesses. The booklet is available on request from the U. S. Government Printing Office, Washington 25, D. C., for 20 cents.

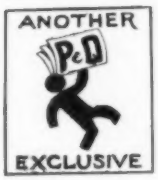
The three-story manufacturing plant of Acme Lite Wate Products Corporation, Salt Lake City, Utah, was recently gutted by a fire causing damage estimated at $75,000. The firm is engaged in processing perlite into lightweight building aggregate and extender for horticulture chemicals.

RICHARD R. REESE recently joined the Alpha Portland Cement Company, Easton, Pa., as salesman in the firm's eastern district office, and has been assigned to Alpha's Lancaster sales area.

The Coming Role of Pozzolans

By WOLF G. BAUER
Consulting Engineer

Part II Incentives for an Industry



IN Part I of this series we discussed some of the basic reasons for using pozzolans in concrete and concrete products, and pointed out that the chemical buffering action exerted by some pozzolans probably represents the most valuable role these materials can play in modern concrete technology. The need for separating pozzolans into at least two major classes was also indicated, and it was shown that some type of "buffering modulus" may eventually have to be adopted for this purpose. Such an index or modulus would be based on tests which summarize the ability of a pozzolan to inhibit expansion due to alkalis and increase resistance against sulphate attack, plus any other acid or salt neutralizing action developed through its use in concretes and concrete products. Also described were the first three of several factors contributing to the sound establishment of a new industry of this type. The other factors follow.

Pozzolans and the Concrete Manufacturer It should be apparent that the ready and economic availability of chemically buffered concrete and concrete products is one of primary interest to the ultimate buyer and user. This, however, is not necessarily the case with the concrete manufacturer and supplier, unless the buffering quality or feature is used as a competitive sales tool applied either within the industry, or in competition with other types of building materials.

If the primary excuse for use of pozzolans in special or universal-type concrete rests in the achievement of water-tightness and durability without additional expense to the taxpayer or private user, there must be benefits for the manufacturer and supplier which will induce him to produce and promote this type of concrete. In this the good quality pozzolans play their secondary role and incentive for use, for they will improve the workability, placeability, uniformity, and extensibility of green concrete, and thus insure a wider safety margin and flexibility in manufacture and field techniques.

In the case of the ready-mixed concrete producer who intends to feature such buffered high-quality concrete for universal applications, there should be little concern over increased production costs arising from the incorporation of pozzolans into the mix. The installation of an extra attached bin or compartment (or a partition in the existing cement bin) and a proper discharge gate leading to the common batching scale will, in most cases, constitute the only investment required, especially as the unloading hopper and elevator used for cement can also be used for the pozzolan handling.

Intimate pre-blending of cement and pozzolan is seldom required, although the concrete mixing technique may require minor changes. Depreciation against these additions should be offset by the somewhat lower cost of most pozzolans replacing a portion of the more expensive cement. In some instances there may be areas where distinct savings can be realized.

There are, then, two primary incentives for the use of pozzolans by the ready-mix plant operator: (1) to make available a superior competitive concrete for his customers, and (2) to provide greater uniformity and a more effective safety margin against aggregate and job variables in mixing and placing.

In the case of the concrete products manufacturer as well, the major incentives for pozzolan use will rest in obtaining uniformity of mix, smoothness of product surfaces due to the plasticizing action of good pozzolans, warmer and more uniform color tones from some of the heat-activated pozzolans, and surfaces which will be free of lime scumming and neutral to paints and pigments. In many cases, higher tensile and flexural strengths, greater densities, and built-in chemical resistance and durability will be bonuses offered to the user.

Extensive tests and field results in the concrete pipe industry have demonstrated unmistakably that proper use of pozzolans can provide not only water tightness and increased resistance to sulphate and weak acid attack, but that such improvements hold also for pipe made with Class II portland cements and the low tricalcium aluminate Class V portlands. Use of pozzolans in spun pipe has also shown a lessening of aggregate segregation brought about by centrifugal forces.

In the manufacture of concrete block, drain tile, reinforced or prestressed joists and beams, slabs and decks, septic tanks, pontoon floats, posts and pilings, and many prefabricated shapes having maximum surfaces exposed to atmospheric and soil conditions or industrial solutions, it is imperative to obtain dense, impervious, lime-free structures of high ingredient uniformity and durability. Proper application of pozzolan-concrete technology to this field should result in increasing recognition and confidence in buffered concretes as the ideal structural material.

When we consider the case of the concrete job contractor who handles large field-pouring operations, it

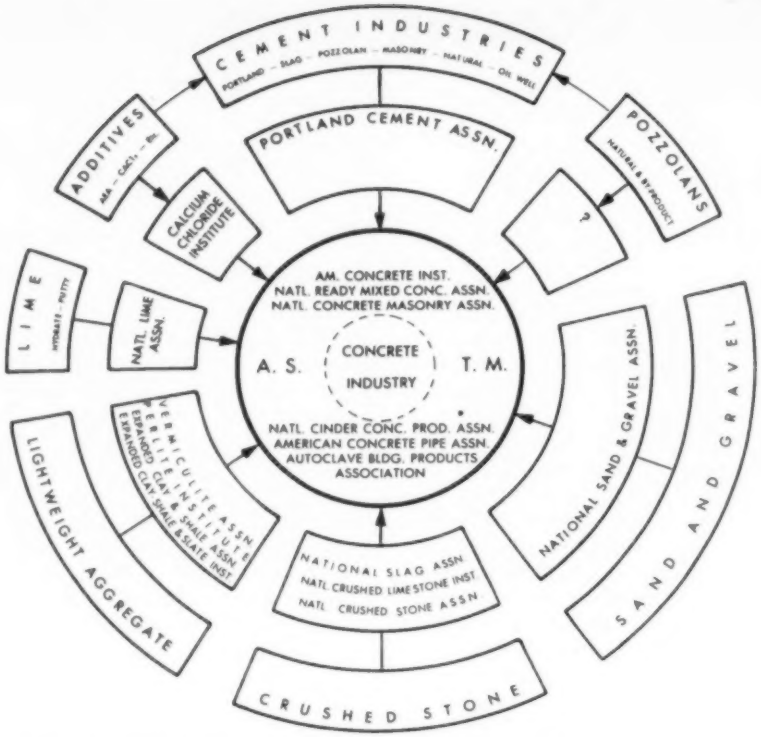
may become entirely possible that the primary incentive for incorporating pozzolans into the mix is one of cost savings, although such operators are also cashing in on the above mentioned improvements in reduced segregation and bleeding and improved workability. On large public works jobs of several types, such savings have run into hundreds of thousands of dollars.

Sometimes such savings have been made indirectly, as for instance, where a questionable but more easily available lower-cost aggregate could be used if protected by the pozzolan buffer. At other times savings have accrued through faster placement techniques with more workable pozzolan concrete, especially if sand gradation was poor, or if, due to lower heat of hydration, larger masses could be poured at one time with less danger of cracking from volume changes. In grouting, too, the pozzolan-cement mix can save money in speeding up the pumping and placement because of lower gravity and increased mobility.

The contractor or user of oil-well cements used for grouting well pipe into the formation to protect it from blowouts, for the prevention of water-oil contaminating seepage, for pipe corrosion protection and permanent pipe stiffening and alignment may employ certain pozzolan-portland cement mixtures of a ratio which will provide the required pumping time without stiffening and setting-up under various pressures and temperatures at depth.

For this purpose some pozzolans blended with general-purpose cements are well suited; they obviate the necessity for obtaining special cements such as zero tricalcium aluminate cement made from portlands with high silica and iron contents. Oil-well pozzolan cements are primarily slow-setting types in which strength does not play a great role. Their special characteristic is controlled thickening time at various temperatures, to assure optimum slurry pumping periods.

In the field of the general contractor of concrete, pozzolans are and will be finding ever increasing use, such as in highway construction, bridge deckings and piers, subsoil basements and retaining walls, harbor and pier structures and breakwaters exposed to seawater sulphates and salts, irrigation canals, basins, sewage works, stacks, and industrial plants, for maximum chemical resistance. The contractor who can offer buffered concrete at no premium, or perhaps even at a saving to the user or himself, will be in a preferred and favorable position. Thus pozzolans can provide the incentives for use in the concrete industries.



Position of a pozzolan industry in the expanding concrete supplier field.

Pozzolans and the Supplier Industries Having considered some of the benefits obtained through the use of pozzolans by both the concrete producer and the ultimate private or public user, let us now take a frank look at the present and the potential supply situation and evaluate the incentives a pozzolan industry has to offer the pozzolan manufacturer.

The pozzolan-cement producer—The portland cement industry has, without question, the greatest eventual interest and incentive in promoting the wider use of "balanced" multi-purpose cements for modern buffered concretes and concrete products. Not only is this industry the logical developer of pozzolans through its facilities in research and manufacture, but it also has the greatest stake in promoting the most workable and durable concrete with the highest built-in safety factor and the widest availability at lowest cost in the face of competition from metals, plastics, and many new combination building materials.

In view of the fact that the cement manufacturer cannot exercise full control over concrete aggregates and use techniques, it is particularly in his interest to develop cements which are of minimum sensitivity to the physical and chemical variables introduced in manufacturing and field service conditions. In some foreign countries the opportunity and responsibility for making buffered and balanced cements available for general use can be traced directly to the efforts and vision of cement manufacturers, although we cannot as yet here speak of pozzolan promotional efforts on an association level. Only a few cement plants have supplied portland-pozzolan cements, and then only on special requests for particular concrete specifications.

There are, of course, a number of pertinent and often private reasons why cement producers have been in no hurry to rush in to the promotion and manufacture of pozzolan-type cements for general-use purposes. First of all, not all cement plants have readily and economically available to them an all-round type of pozzolan raw material that can be processed and blended at the plant to produce such a cement. Those operations which can obtain such material, either natural or artificial (by-product) may feel that the investment and effort required in installing a parallel drying-activating-grinding-classifying-blending control line is not justified until both demand and competition require it. The relative softness of some pozzolans, such as the shale and clay types, would preclude extensive intergrinding with harder clinkers, and separate grinding and subsequent blending systems would be needed. Managements of plants geared to large capacity and output of standard-type cements would feel that an initial low-tonnage item would tend to upset established controls and operations, and would actually result in higher rather than lower production costs for the new cement.

Another and perhaps less obvious reason for the apparent passive attitude still prevailing among cement producers who have not as yet been involved in competitive portland-pozzolan supply demands is perhaps a lack of information. There is an inadequate understanding of pozzolan reactions for control purposes, of the large number of variables in raw materials and processing results, and of the absence of fully protective specifications. Whether these reasons are all valid or not, they may explain in part, at least, the apparent apathy toward a more vigorous pozzolan-cement development plan on a broad long-term basis, despite the increasing and ever more convincing world-wide evidence of the correctness and justifications for considering pozzolans among the welcome tools for the modern concrete technologist.

There are also sound reasons for co-operation between a growing pozzolan industry and the cement industry. If a new pozzolan industry, for the sake of argument, were actually based on the development of a radically new type of cement, there might be cause for initial consternation on the part of portland cement industry leaders, since it would amount to a condition which would finally turn into all-out competition with the new rival. Here, however, we stand on the threshhold development of a cement-enhancing material which can only increase the adaptability and range of concrete uses, and put extra meaning into the major sales approach the industry possesses, namely "concrete for permanency."

To the far-sighted cement producer there may be other reasons for welcoming a responsible and well-dispersed pozzolan supplier industry, because the availability of controlled all-purpose high-buffer pozzolans will lessen (in some cases eliminate) the need for producing special-purpose Class II, IV, or V, or low-alkali cements, thus simplifying cement processing, and eliminating regional advantages or disadvantages in the matter of raw material and process limitations from a competitive standpoint.

It may then be assumed that in the initial years of education and introduction, at least, most cement producers will look to outside pozzolan manufacturers and suppliers to fill a growing demand for buffered multi-purpose concretes. Even so, the pozzolan producers will need the sanctioning approval and co-operation of the portland cement industry beyond a passive wait-and-see attitude; for what is good for concrete is good for cement, even if lower cement requirements should develop for concretes employing pozzolanic admixtures.

The attitude of cement industry leaders, as we see it, will be one of continued interest and support in a broad research development of pozzolans for specific needs, rather than for general use. It would be only natural for cement makers in some quarters to show a somewhat apprehensive disposition toward a too rapid and over-confident promotion of "limited type" pozzolans by suppliers lacking the basic technical know-how and an appreciation for the large responsibilities that will be theirs. This is especially so in the matter of adequate product research and processing control, which should match that of the cement industry. Those of us who have evaluated, developed, and commercially processed pozzolans would share such a concern and know its basis.

The pozzolan producer—A pozzolan manufacturer may start or operate completely independently in the field, without ties or involvements of any kind. Again, he may be an operator in the construction materials field, such as a producer of clay products, expanded aggregate, or concrete products. In these operations he may use (or market) a small or major portion of the pozzolan product.

In the case of the by-product pozzolan supplier, he may fill only the role of distributor, as with fly-ash pozzolans; or he may process and sell direct only to a cement producer, as may also be the case for water-quenched slag pozzolan. He may be occupied in a completely unrelated field, such as metallurgy, coal mining, filter-aid, or ceramic products manufacture in which he can sell the pozzolanic waste or by-product as raw material or as a processed and finished product.

Due to the varied problems and processes brought on by the great variety of pozzolanic raw materials, the formation of an integrated and representative national association is anything but an easy matter. We have already witnessed an example of preferential association and alignment of lightweight clay-shale aggregate producers or steam-cured concrete products manufacturers on the basis of process machinery, rather than product use, development, and marketing.

In these times of serious competitive-product inroads into our minerals-base construction materials industry, such duplication and division of talent and finances may not be the most farsighted policy on the overall industry level. A potential division along lines of manufacturing interests or raw material source could very easily serve to scatter and inhibit the proper and positive development of a new pozzolan industry and eventual association, as it would have to rely heavily on the initial sum total experience available

(Continued on page 96)

Small Plant Displays

By BUREN C. HEROD

ANOTHER ON THE SPOT REPORT

SIMPLICITY and do-it-yourself are bywords of the Perry Sand & Gravel Company, a small but efficient operation at Perry, Iowa. Operated by Earl White, one of two partners, this 300-t.p.d. plant produces gravel and concrete and mason sands to meet impressive, steady demands from customers within a 25-mile radius; and it is comprised largely of operating equipment fabricated in the company's own shop.

With the exception of one screen, all equipment and structures in the operation were designed by Mr. White and built by him and his employees. The setup includes a 6-in. suction dredge, a vibrating screen, a scalping tank, and a pair of wet cyclone classifiers, all plant units being arranged in a simple straight-line flow.

In operation a little more than a year, this plant was built as a successor to an older operation on another site near Perry, where the deposit had been fully depleted. The present site, which contains substantial reserves of high-quality gravel, was opened about two years ago, and the pit-run material was trucked to the original Perry plant, which was operated on dry feed. However, when the first deposit was worked out, it was decided to dismantle and move the equipment to the present location, to add processing units, and to convert to feed *via* direct line from a suction dredge.

The latter is the second such unit

This view of the dredge, with the suction head raised, shows the monitoring jet, the trap where plus 3-in. material is caught and rejected, the 6-in. dredge pump, and its diesel engine drive.

Only 2 ft. of overburden must be removed from the Perry gravel deposit, which has a depth of 14 to 20 ft. of top-quality material.

most of equipment in compact sand and gravel operation designed and built by owners

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to be designed and built by Mr. White and his business partner, John McCarthy. The first was constructed to supply a plant at Adel, which was operated by these men until early in 1957. That original dredge was purchased by an out-of-state producer, and the Adel operation was then sold. When the first operation at Perry was faced with depletion of reserves, it was decided to take advantage of the high water table—the present pit area is very near the Raccoon River west of Perry—and employ dredging to supply the relocated and revised plant.

In the 40-acre tract where the plant was rebuilt, there are from 14 to 20 ft. of top-quality gravels below only 2 ft. of overburden. The top size in recovered material is, at present, about 2 in., and there is approximately 70 percent sand and 20 to 25 percent plus ¼-in. material in the dredge discharge. When it becomes necessary, the suction head on the dredge will be changed to recover whatever heavy gravels may be left in the pit.

Preceding dredge advance, the overburden is removed from the banks of the dredging lake by a 1½-cu. yd. P&H dragline. This soil is generally in demand in the area, and it has not been necessary to create spoil piles. The area in which the dredge was assembled for initial operation had been excavated below water table by the dragline.

Four pontoons, 20 ft. long, 5 ft. wide, and 3 ft. deep, bolted together,

Compactness and simplicity of design is evident in this view of the entire plant. At the left are the two cones; at the center, the scalping tank; and at the right center, the pump box, top screen, log washer, and finishing screen. All units except the top screen were fabricated in the company shop.

The dredge discharge line (right) enters the pump box at the top of the plant. Retained fractions are fed to the log washer.

The log washer discharge passes over the lower screen, from which finished gravels drop to underlying bins.

form a square 20- by 20-ft. hull on which the dredge machinery is installed. The latter includes the 6-in. Kansas City Hay Press dredging pump, and the Cat 13000 diesel engine with which it is driven, plus a small seal pump, and a diesel fuel tank. Positioning is handled *via* cables strung to anchorage on the bank.

As shown in an accompanying photograph, the suction head and following short length of rigid suction line are suspended from an A-frame boom. They are raised or lowered by cables through the boom sheave and a pulley arrangement. Immediately behind the nozzle on the suction head is a trap with a barred, hinged gate, which is used to stop plus 3-in. gravel. This material can be dropped from the trap through the trapdoor shown. Attached to the upper surface of the suction nozzle is a monitoring jet.

About 10 percent of the dredge pump discharge is solids, or approximately 35 t.p.h. This is transferred *via* the pontoon-supported pumping line to the top of the plant. Here it is discharged into a circular pump box equipped with baffle plates to reduce feed velocity.

From the pump box, the flow passes directly to a 3- by 8-ft. Simplicity double-deck shaker screen. Separation is made on a 1½-in. opening top deck, and a lower deck fitted with $\frac{3}{16}$-in. slotted cloth for the first 6 ft., and 8-mesh cloth on the final 2 ft.

The top-deck retained fraction is chuted over the side to a pile of oversize used as fill material. Thought has been given to installing a crusher to further process this gravel. The lower-deck retained fraction is fed to a 24-in. by 15-ft. single-screw log washer. A 3-in., 300-g.p.m., Carver pump installed on a float delivers water from the dredging lake to the log washer tub and bearing.

Discharge from the log washer is fed to a following 3- by 6-ft. vibrating screen on which a ⅜-in. separation is made. These ⅜ x 1½, and $\frac{3}{16}$ x ⅜ finished products are dropped into underlying bins.

Returning to the first screen. throughs from the first 6 ft. on the bottom deck of this unit are flumed to a 10- by 11-ft. scalping tank designed by Mr. White. The minus 8-mesh throughs from the last 2 ft. of the first screen's bottom-deck flow through a by-pass around the scalping tank, and enter a flume carrying overflow from the latter to the pair of cone classifiers.

The scalping tank, which is cen-

The angled flume (left) carries a part of the top screen's bottom-deck throughs in by-passing the scalping tank. The balance of the material passing the bottom deck enters the scalping tank. At the top center is the circular pump box.

trally fed, as seen in an accompanying illustration, was added to the plant when it was re-erected at this site. It is equipped with a Roto-Bin-Dicator and G-E thrustor. As sand builds up in the lower part of the tank, the rotating paddle is stalled, which actuates a limit switch controlling the thrustor. The latter in turn operates a discharge port at the bottom of the tank. A weight on the thrustor causes it to close the valve when the sand has been discharged. The finished product of this unit is concrete sand.

Overflow from the scalping tank, as noted above, is flumed to a pair of 3-ft. diameter cones in which mason sand is extracted. These cones are 4 ft. deep, and are equipped with diaphragm-rod arrangements for opening and closing the bottom discharge valve. The weight of material on the diaphragms pulls down on the vertical rods, and when the sand has been discharged, a weight attached to an arm at the top of each rod pulls them up, thus closing the valves. Overflow from the cones is flumed to a settling area near the dredging lake.

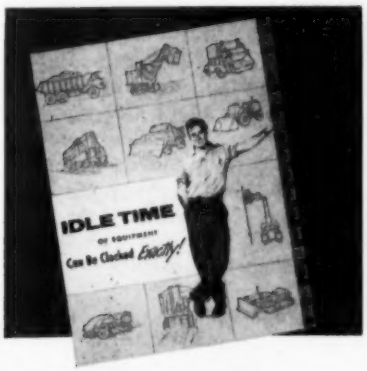
Plant products are rehandled into adjoining stockpiles by an International TD14 tractor with a dozer and an Insley crane equipped with an Owens clamshell bucket. The latter is also used for truckloading from all stockpiles. Gravel, however, may also be loaded directly from the bins below the finishing screen.

In addition to Mr. White, this compact facility requires at the most the attention of two other men. Robert White, a brother, oversees the plant operation and handles utility equipment with the assistance of a third employee, as required.

Loading out stockpiled materials. Gravel may also be loaded directly into trucks from the bins below the finishing screen.

Overflow from the scalping tank is flumed to the two cones, where mason sand is extracted. Just to the right of the flume (background) are the counterweights for the cone valve rods.

JACK L. BAXTER, former assistant plant manager for the Ideal Cement plant at Redwood City, Calif., has been promoted to plant manager.



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Pozzolans

(*From page 91*)

from all sources of applied pozzolan technology.

The base from which industry must be built ought to represent first the findings and understandings derived from pure and basic research; technical process refinements should be secondary considerations. Thus the course along which the coming pozzolan technology will be charted will have a common origin, direction of effort, and goal for all who embark upon a pozzolan manufacturing and development program.

Much of future pozzolan investigational work must parallel that being carried on by the cement and concrete industries and associations. These groups have footed most of the bill and supplied much of the information now making a pozzolan industry possible. Filling the gaps in our present limited knowledge of the basic mechanisms involved in the pozzolan-cement-aggregate-water-ion-gel system reactions will be an activity to challenge a growing pozzolan industry for many years to come. Much more susceptible to early results and achievements will be the advances in better controlled and more efficiently performed processing techniques. Nevertheless, both the scientific approach and the technical search for better cementing materials and concretes therefrom need to occupy and interest every contributor and supplier to the broad modern concrete industry, the major components of which are depicted in the chart on page 90.

Aside from the problems of organizing an industry on the basis of an overall pozzolan technology, which cuts across the many types and sources of raw material and manufacturing techniques, just as does the portland cement industry, a young pozzolan industry will also need to dovetail its educational program for superior concrete with that of the cement and concrete industry. In this field, too, responsible pozzolan producers will be able to perform valuable service to these industries by joining in the effort to develop more foolproof easy-working, watertight, and chemically durable concrete with the many available aggregates now in use.

The incentive for developing a pozzolan manufacturing operation and market must, of course, rest upon adequate financial returns. It may be stated in general terms that, on the basis of raw material tonnage quarried, a pozzolan plant can show a greater profit margin and higher returns on the investment than many comparable minerals processing industries. It is, of course, apparent that such a condition is tied directly to the product selling price, which may vary anywhere from one-half to equal the price of cement for the particular sales territory.

In many of the studies undertaken by the writer, it has become apparent that the earnings to be realized per ton of raw material mined, such as clay or shale, for instance, are at least one-half again as much from activated and processed-pozzolan production than from ceramic heavy clay products produced from the same material; or up to three times as much as could be realized from producing a lightweight aggregate from the same pit material, assuming that the selling price of the pozzolan were about 75 per cent of the price of local general-purpose cement. It should be noted, however, that market and product development and control costs are considerably higher proportionally in the case of pozzolan processing than they are for aggregate processing, for example, as is also the investment per ton of production.

Nevertheless, the financial incentive for the potential pozzolan producer will be adequate and better-than-average for minerals-processing industries supplying the building materials field. However, the establishment for a processing plant will require more-than-average development effort and cost, as well as time for achieving optimum operational capacity. This latter generality is related to local conditions, such as whether there is an established or a non-competitive pozzolan market in the area, whether the material can be processed into a high-quality all-purpose type pozzolan, and whether the concrete and concrete products industry is well diversified in the region.

In a future installment in this series we shall discuss in some detail the technical problems peculiar to the establishment and operation of processing plants using various types of pozzolanic raw materials.

A new cement plant with an estimated production rate of 30,000 metric tons annually is planned at Antofagasta, Chile, according to an announcement made by the Government Economic Development Corporation. The cost of the plant is expected to reach $100,000.

A barter deal was recently finalized between the governments of Pakistan and the Soviet Union for the import of 50,000 tons of Soviet cement in exchange for Pakistani jute. The first shipment of cement is to be delivered this summer.

JACK L. BAXTER, former assistant plant manager for the Ideal Cement plant at Redwood City, Calif., has been promoted to plant manager at the same location.

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Production and Value of Sand and Gravel in 1958

By KENNETH E. TOBIN JR.
Associate Executive Secretary
National Sand and Gravel Association

THE National Sand and Gravel Association has completed its sixth annual survey of the production and value of sand and gravel. This survey is designed to fill the need for a current measurement of the contribution which the sand and gravel industry makes to the national economy.

Questionnaires were sent to the 2,058 sand and gravel companies in the United States and Canada of which we have record. Returns were received from 797 companies, operating 1,283 plants. Limited data were also available on 47 member companies, operating 94 plants, which did not return the questionnaire. These latter statistics have been incorporated in the study wherever possible, making a total participation of 844 companies, operating 1,377 plants, or 41 percent of the total companies surveyed. We believe the reporting companies produced a majority of the total commercial sand and gravel tonnage in 1958.

Attached are four tables which reflect the results of the survey. Table 1 shows that the reporting companies produced 267,808,002 tons of sand and gravel, valued at $302,918,129, at an average of $1.13 per ton. The results of our 1956 and 1957 surveys are also included in Table 1. Our 1958 survey reveals that sand and gravel production increased last year, as compared with production in 1957 of 216,462,438 tons, by 51,345,564 tons, or approximately 24 percent.

The increase in 1958 production, when compared with 1957, is reflected in total values. Last year the value of sand and gravel, as compared with 1957, increased from $238,781,682 to $302,918,129, or approximately 27 percent. The average value per ton of sand and gravel increased from $1.10 to $1.13, or approximately 3 percent.

The average production of the reporting companies and the average production per plant declined slightly from 1957. The average production per company in 1958 was 317,308 tons, compared with an average production per company of 358,382 tons in 1957, a decline of 41,074 tons per company, or 11 percent. Similarly, average production per plant declined from 203,634 tons in 1957 to 194,487 tons in 1958. This is a decline of 9,147 tons per plant, or approximately 4 percent.

An analysis of the foregoing data indicates that the reported increases in total production and total value of sand and gravel in 1958 were due largely to the increased participation in our survey by 240 more companies than participated in the 1957 survey. The 844 companies participating in the 1958 survey represent the largest participation for any year since these annual surveys were launched in 1953. The increased participation of 240 companies represents an increase in terms of participating companies of 41 percent, making it difficult to compare total production value data for 1958 with corresponding data for previous years if the purpose of such comparison is to develop a measure of the industry's increased or decreased activity from year to year.

Table 2 is an analysis of the methods of transportation employed by the sand and gravel industry for shipping its product in 1958. Included for purposes of comparison are data from our 1957 survey. The respective percentages of the three types of transportation show a substantial increase in transportation by truck with corresponding declines in transportation by rail and water. The increase in the tonnage hauled by truck conforms to a general pattern over the past decade which has shown an ever-increasing use of truck transportation, with most of the decline being reflected in the tonnages transported by rail.

In 1958, truck transportation carried 181,543,490 tons of sand and gravel, or 73.1 percent of the reported production. The railroads transported 42,335,436 tons, or 17 percent of the production. Water transportation accounted for 15,284,010 tons, or 6.2 percent of the total. We were not advised of the specific breakdown by type of transportation for 9,204,478 tons, or 3.7 percent of the total.

Table 3 summarizes the consumption of sand and gravel in 1958 by type of consumer. The heavy construction industry (industrial buildings, highways, streets, etc.) consumed 109,554,954 tons, or 44.1 percent of the total. This represents a slight increase in the percentage consumption by heavy construction from that reported in 1957. The ready mixed concrete industry was the second largest purchaser of sand and gravel, using 78,154,698 tons, or 31.5 percent of the reported production. This was also a slight increase in percentage consumption by ready mixed concrete when compared with 1957.

It should be noted that Table 3 contains an additional breakdown for the railroad ballast category which did not appear in the corresponding table for previous years. At

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the request of several producers, the railroad ballast tonnage is divided into three categories: (1) prepared, with less than 40 percent crushed; (2) prepared, with more than 40 per cent crushed; and (3) unprepared, or bank run.

California led all states with a production of more than 47,000,000 tons, followed by Michigan, Illinois, Ohio, New York, Pennsylvania, and Texas, in that order. Michigan led all states in total number of companies reporting with 100, followed by California, Pennsylvania, Ohio, and New York, in that order. . . .

Table 4 is an analysis of the distribution of sand and gravel production in 1958 by size of company, based on returns from the 797 reporters, plus the 47 member companies whose statistics were otherwise available, for a total of 844. The largest number of companies are in two brackets: 50,000-100,000 tons, in which there are 148 companies, responsible for 4 percent of the total production; 100,000-200,000 tons, in which there are 200 companies, responsible for 10.6 percent of the total production. These are the same two production brackets in which the majority of companies participating in our 1956 and 1957 surveys were classified.

Eleven companies reported individual production of more than 3,000,000 tons of sand and gravel last year, accounting for more than 18 percent of the total production. Conversely, the 76 percent of companies in the smaller brackets produced approximately 25 percent of the total tonnage.

TABLE 1—Sand and Gravel in 1956, 1957 and 1958

	1956	1957	1958
Production:			
Sand (tons)	104,970,811	97,170,144	119,989,477
Gravel (tons)	134,824,523	119,292,294	147,818,525
Total (tons)	239,795,334	216,462,438	267,808,002
Value:			
Sand	$105,080,012	$ 97,678,911	$123,203,844
Gravel	160,145,532	141,102,771	179,714,285
Total	265,225,544	238,781,682	302,918,129
Average value per ton:			
Sand	$1.00	$1.01	$1.03
Gravel	1.19	1.18	1.22
Total	1.10	1.10	1.13
Companies surveyed	1,597	1,463	2,058
Companies reporting	604	604	844
Number of plants operated by reporting companies	975	1,063	1,377
Average production per reporting company (tons)	397,012	358,382	317,308
Average production per reporting plant (tons)	245,944	203,634	194,487

1958 totals include 47 member companies not actually replying to the questionnaire but whose production of 19,440,588 tons of sand and gravel was otherwise available.

TABLE 2—Methods of Transportation of Sand and Gravel in 1957 and 1958

Type of Transportation	1957 Short Tons	1957 Percent of Total	1958 Short Tons	1958 Percent of Total
Truck	139,909,291	68.4	181,543,490	73.1
Rail	41,074,199	20.1	42,335,436	17.0
Water	16,481,389	8.1	15,284,010	6.2
Unspecified	6,959,926	3.4	9,204,478	3.7
Total	204,424,805	100.0	248,367,414	100.0

TABLE 3—Consumption of Sand and Gravel in 1958

Type of Consumer	1957 Short Tons	1957 Percent of Total	1958 Short Tons	1958 Percent of Total
Construction (buildings, highways, streets, etc.)	87,539,342	42.8	109,554,954	44.1
Ready mixed concrete	62,217,285	30.4	78,154,698	31.5
Concrete products	8,485,255	4.2	11,657,266	4.7
Railroad ballast:	4,905,648	2.4		
(1) Prepared				
(a) Less than 40% crushed			1,603,884	0.6
(b) More than 40% crushed			1,218,934	0.5
(2) Unprepared (bank run)			3,757,717	1.5
Sold through dealers	24,784,291	12.1	21,902,551	8.8
Other	8,812,552	4.3	10,207,501	4.1
Unspecified	7,680,432	3.8	10,309,909	4.2
Total	204,424,805	100.0	248,367,414	100.0

TABLE 4—Distribution of 1958 Sand and Gravel Production by Size of Company

Size Group (tons)	No. of Companies	No. of Plants	Production (tons)	Percent of Reported Production	Percent of Participating Companies	Percent of Participating Plants	Accumulated Percents of Totals: Total Production	Total Companies	Total Plants
0 – 25,000	94	98	1,237,936	0.5	11.1	7.1	0.5	11.1	7.1
25,000 – 50,000	101	110	3,759,137	1.4	12.0	8.0	1.9	23.1	15.1
50,000 – 100,000	148	174	10,795,651	4.0	17.5	12.6	5.9	40.6	27.7
100,000 – 200,000	200	254	28,415,371	10.6	23.7	18.4	16.5	64.3	46.1
200,000 – 300,000	99	134	23,670,023	8.8	11.7	9.7	25.3	76.0	55.8
300,000 – 400,000	48	83	16,454,498	6.2	5.7	6.0	31.5	81.7	61.8
400,000 – 500,000	37	78	16,416,018	6.1	4.4	5.7	37.6	86.1	67.5
500,000 – 600,000	19	35	10,388,339	3.9	2.3	2.6	41.5	88.4	70.1
600,000 – 700,000	11	22	6,994,918	2.6	1.3	1.6	44.1	89.7	71.7
700,000 – 800,000	11	35	8,345,558	3.1	1.3	2.6	47.2	91.0	74.3
800,000 – 900,000	10	25	8,351,991	3.1	1.2	1.8	50.3	92.2	76.1
900,000 – 1,000,000	9	17	8,551,384	3.2	1.1	1.2	53.5	93.3	77.3
1,000,000 – 2,000,000	35	174	49,284,824	18.4	4.1	12.6	71.9	97.4	89.9
2,000,000 – 3,000,000	11	56	26,489,418	9.9	1.3	4.1	81.8	98.7	94.0
3,000,000 – 5,000,000	8	47	29,518,078	11.0	0.9	3.4	92.8	99.6	97.4
Over 5,000,000	3	35	19,134,858	7.2	0.4	2.6	100.0	100.0	100.0
Total	844	1377	267,808,002	100.0	100.0	100.0			

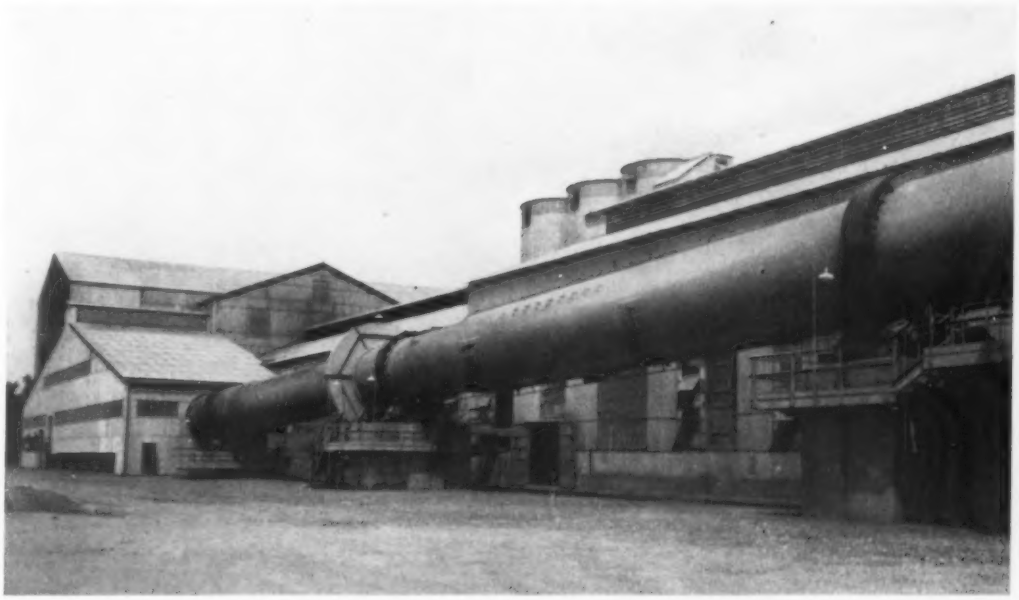
This table does include the 47 member companies which did not return our questionnaire, but whose total production of 19,440,588 tons of sand and gravel was otherwise available.

PIT and QUARRY

JULY 1959

THIRTY-FIRST ANNUAL CEMENT MILLS SECTION

SMIDTH ROTARY KILNS



Over 1250 Smidth Rotary Kilns have been supplied

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Paris (9e) France

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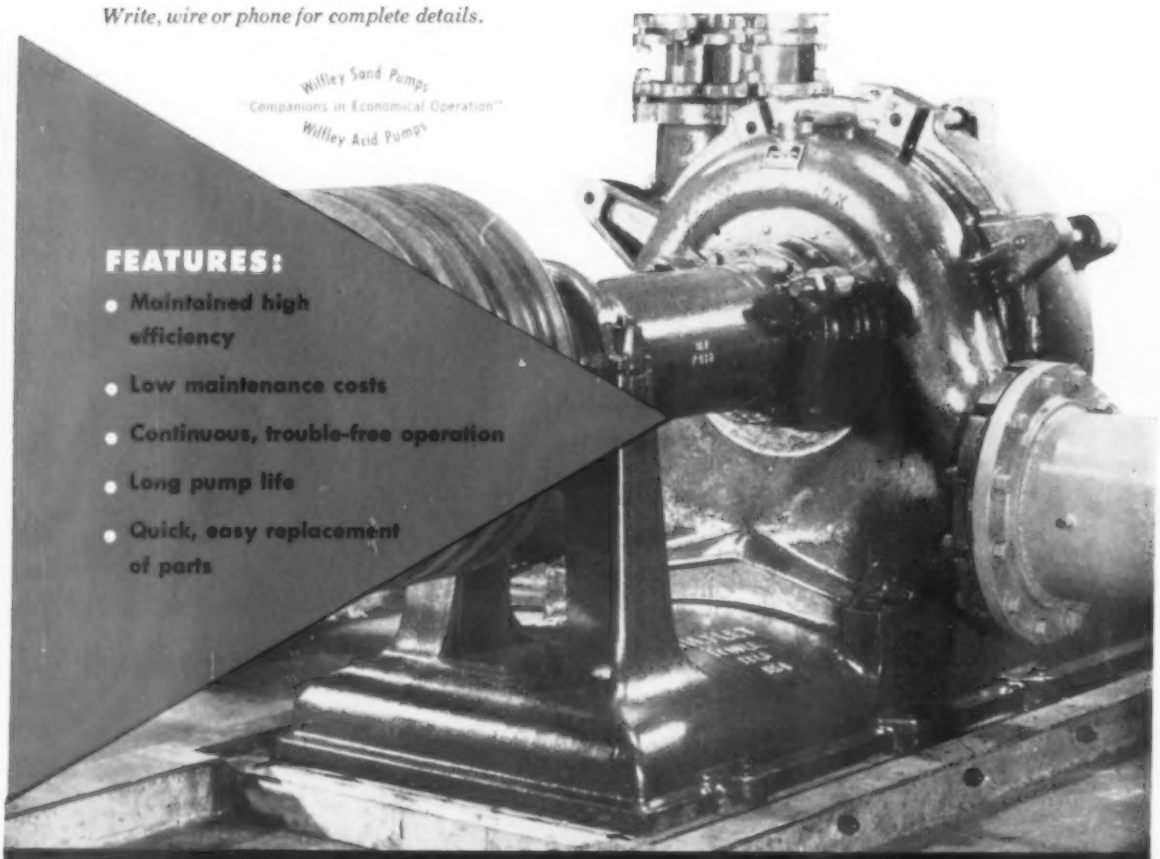
NEW! WILFLEY

10" Sand Pump for Higher Tonnages

Now, to meet the increasing demand for higher tonnages, Wilfley introduces a new 10" slurry pump! This addition to the famous Wilfley Model "K" pump line will be available with a variety of abrasion-resistant alloys and interchangeable, soft rubber-covered wear parts. The economical operating features of all Wilfley Sand Pumps are built into this new model. *Individual Engineering on Every Application*

Write, wire or phone for complete details.

Wilfley Sand Pumps
"Companions in Economical Operation"
Wilfley Acid Pumps



FEATURES:

- Maintained high efficiency
- Low maintenance costs
- Continuous, trouble-free operation
- Long pump life
- Quick, easy replacement of parts

When you buy quality, Wilfley quality, you buy superior performance.

A. R. WILFLEY and SONS, INC.

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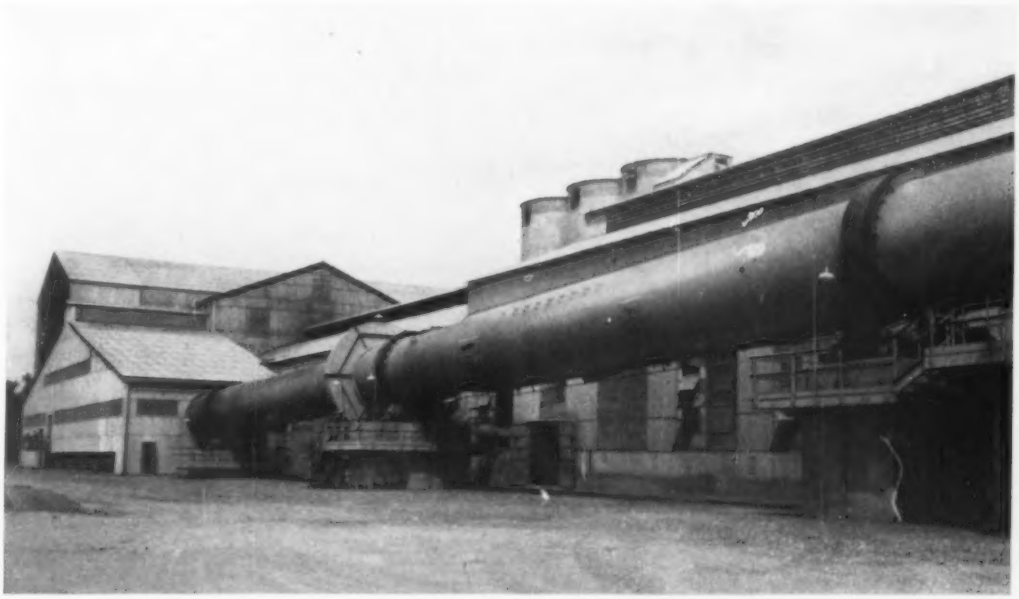
PIT and QUARRY

JULY 1959

THIRTY-FIRST ANNUAL
CEMENT MILLS SECTION

SMIDTH ROTARY KILNS



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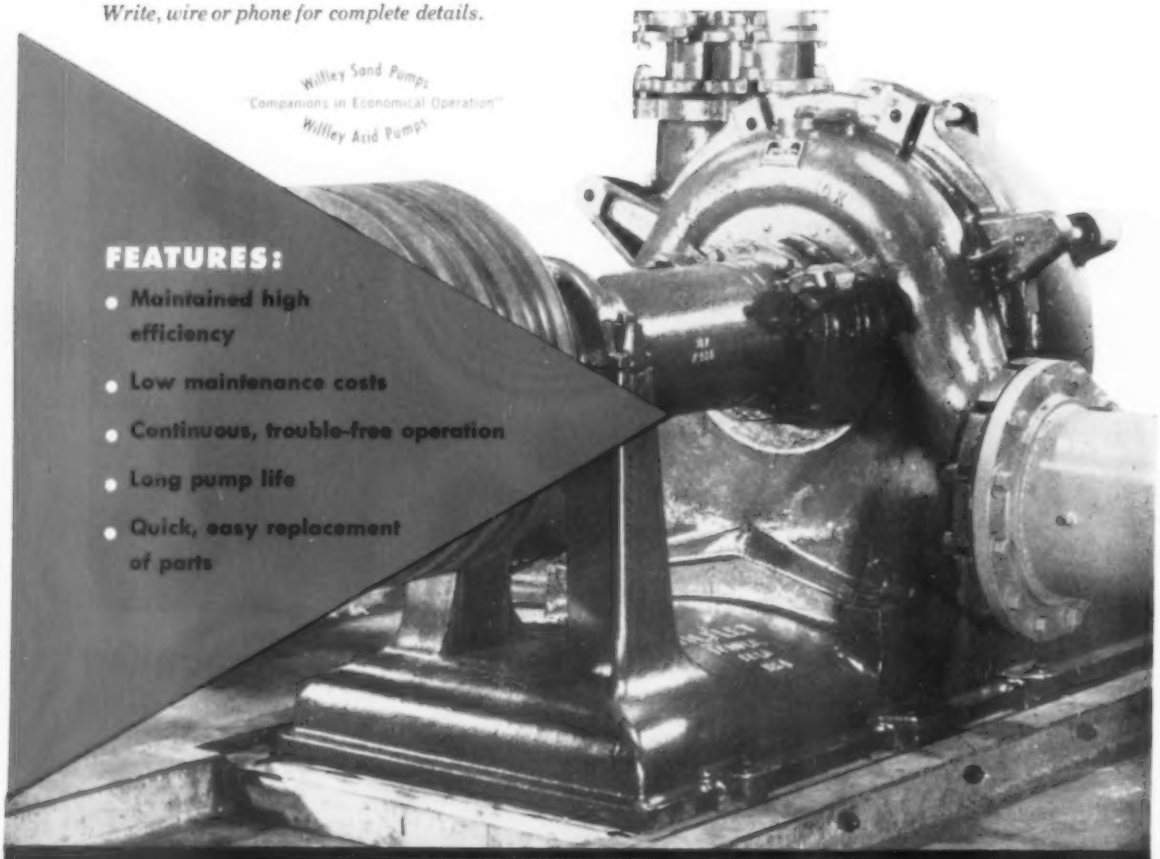

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STRAIGHT DOPE about Bemis Extensible Multiwalls

right from (you'll pardon the expression) the horse's mouth

Who knows best how filled multiwalls handle? . . . what kind of service they will give?

The men who handle them, of course.

So, read these comments about Bemis Extensible Multiwalls by men who know from experience:

Cement plant superintendent:
"These extensible bags are the best paper bags we have ever used. As far as I am concerned, we won't use anything else."

Cement packhouse foreman:
"I caught my men amusing themselves by letting these 'rubber' bags run off the end of the conveyor and bounce on the cement floor. Our regular bags burst on this drop."

Assistant cement packhouse foreman:
"We broke only two bags in two weeks. We don't want anything else."

Assistant cement plant superintendent:
"Sure, we will work with you to improve carloading; but your extensible bags have eliminated our serious customer complaints."

Cement company traffic manager:
"I didn't believe you before, because I have heard exorbitant claims in the past. Now I am sold—we haven't had a serious complaint since we switched to your 'stretch' bag."

Building materials dealer:
"They (extensible bags) feel and handle something like the old cotton sacks. They stand rehandling better than the bags we have been getting. We even have refill bags left over. Whatever it is, we want more."

Those are the voices of experience. But try 'em yourself . . . and prove by your own experience. Call your Bemis Man right away about Extensible Multiwalls.

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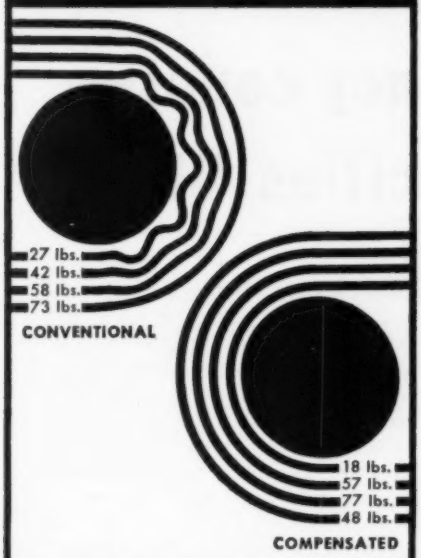
RAY-MAN CONVEYOR BELT
Lasts Longer on Tough Hauls

R/M engineering makes the difference with Ray-Man Conveyor Belt. Cushioned strength members give it the resiliency to take the impact of shock loading . . . the flexibility to train better, trough naturally. Balanced *Double*-Compensation relieves outer ply stresses, prolongs belt life under the most rugged operating conditions. R/M's exclusive "XDC" Cover gives Ray-Man extra protection against wear, tear, cuts and abrasion never before possible.

Ray-Man Conveyor Belt is rip resistant. It requires no breaker strip . . . holds fasteners far better than other constructions. Like all R/M heavy duty conveyor belts, Ray-Man is both moisture resistant and mildew-proof. Let an R/M representative show you the engineered advantages of Ray-Man Conveyor Belt and other R/M constructions . . . extra-cushioned Homocord for unusually severe shock loading . . . R/M Tension-Master for extra long lifts, high tensions. Write for Bulletin M302.

STRESS-RELIEF OF OUTER PLIES MEANS LONGER BELT LIFE... "More Use per Dollar"



CONTROLLED PLY ELASTICITY

Note how Double-Compensation at right equalizes ply stresses.

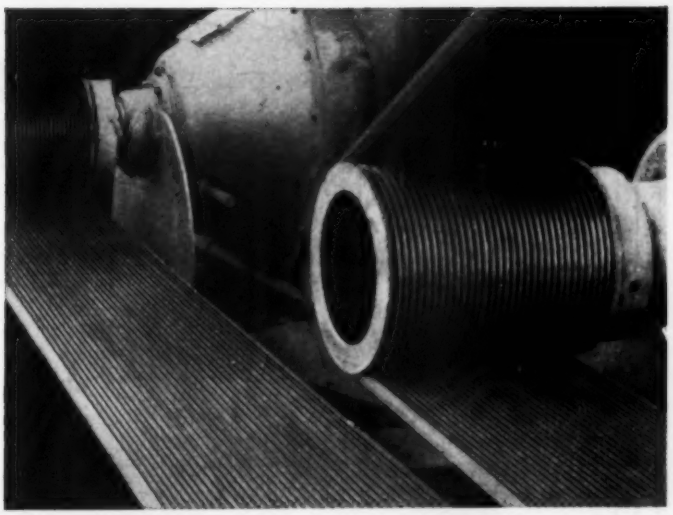
1. Center plies on neutral axis and better protected carry more load.
2. Outer plies stress-relieved by adjusting to tension and compression.

INDUSTRY'S *ONLY* COMPENSATED BELT

Ray-Man Compensation relieves outer ply stress . . . allows outside ply to elongate more than inner plies as the belt flexes around the pulleys. Inner plies no longer "loaf", but carry full share of the load.

Outer ply is better able to absorb strain and impact of loading, pull as a strength member, *protect* the inner plies, hold fasteners or splice longer.

And, because Ray-Man is *double Compensated*—both top and bottom plies stress-relieved—Ray-Man Compensation prolongs belt life, even where operated over reverse bend, snub or take-up pulleys!



R/M POLY-V® DRIVE—*MORE* POWER IN *LESS* SPACE

A single unit belt across full width of the drive sheave . . . not an assembly of V-belts . . . gives patented Poly-V twice the tractive surface to deliver up to 50% *more* power in the same space as a V-belt drive — or *equal* power in ⅔ the space! Multiple-belt "matching problems" are eliminated . . . equipment downtime and belt replacement costs reduced to a minimum. Poly-V assures constant belt speed ratios from no load to full load to provide the smoothest and coolest running—longest wearing drive for your heavy duty power driven equipment. Just two Poly-V* belt cross-sections meet every requirement! Write for Bulletin M141.

*Poly-V is a registered Raybestos-Manhattan trademark. Patented.

HOMOFLEX HOSE—HANDLES EASIEST ON THE JOB

R/M's exclusive construction for air, water, other fluids and gases is as flexible as a rope! Homoflex Hose has no pre-set twist . . . coils and uncoils freely in *any* direction — *without* kinking. Light in weight, yet strong enough to stand up under the toughest conditions, Homoflex is the easiest handling hose made for rugged general service. Inseparable tube-to-cover bond greatly increases hose life . . . reduces hose costs! Uniform inside and outside diameters make Homoflex easier to couple, too . . . assure fuller, faster flow on every job.

Only R/M offers exclusive Homoflex Construction. Write for Bulletins M694 and M610.

RMD15

BELTS • HOSE • ROLL COVERINGS • TANK LININGS • INDUSTRIAL RUBBER SPECIALTIES

MANHATTAN RUBBER DIVISION — PASSAIC, NEW JERSEY

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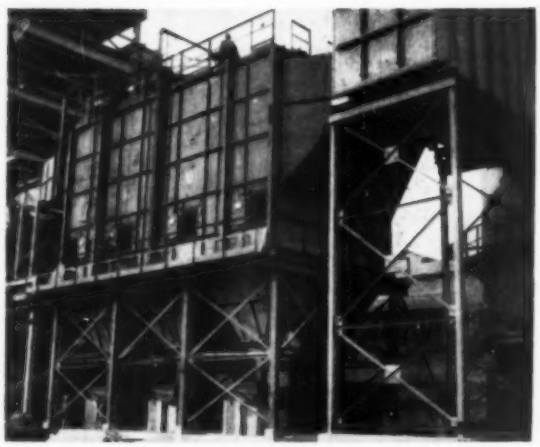
PRECIPITATORS

CYCLONE COLLECTORS

Where extra efficiency counts... Industry specifies BUELL

Buell Cyclone Collectors have the exclusive "Shave-off" design which utilizes double-eddy currents within the cyclones to trap an extra percentage of dust and minimize re-entrainment. Large-diameter design prevents bridging, clogging, or plugging. Extra heavy plate construction contributes to long life. Buell-designed manifolding adds to efficiency of operation. Thoroughly described and illustrated in a booklet, "The Exclusive Buell Cyclone."

Buell "SF" Electric Precipitators provide extra efficient recovery of dusts and lower maintenance costs year after year. The exclusive *Spiralectrodes* deliver 50 to 100% more electron emission than other types of emitting electrodes. Their self-tensioning characteristic minimizes electrode breakage. Buell Continuous Cycle Rapping practically eliminates "puffing". Positive Gas Flow Control through adjustable baffles assures maximum efficiency. Write for a copy of the extensively-illustrated booklet, "Buell 'SF' Electric Precipitators."

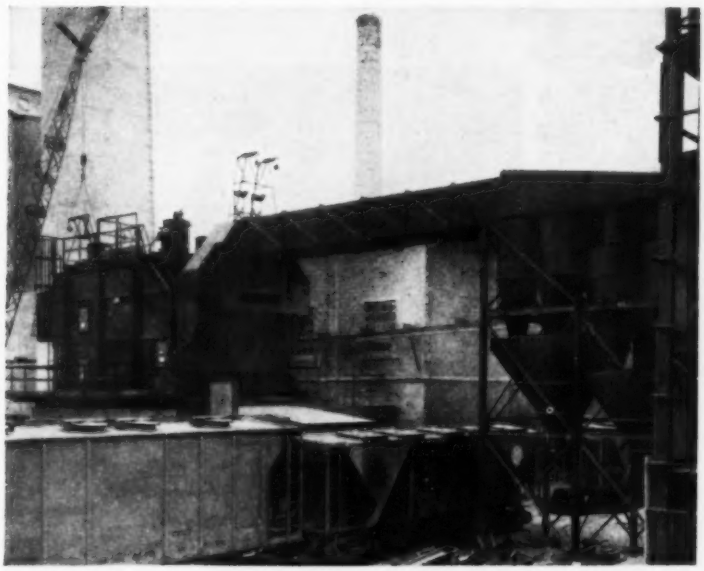


Nine of the 11 electric precipitators purchased by the American cement industry in 1958 were sold by Buell.

Experts at delivering Extra

COMBINATION SYSTEMS

CLASSIFYING SYSTEMS

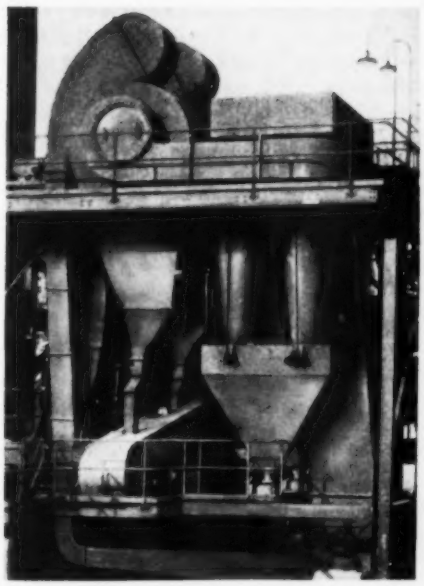


Buell Combination Precipitator/ Cyclone Systems provide the ultimate in dust collection efficiency *under all conditions.* The operating principles of cyclones and precipitators complement each other, assuring maximum efficiency and stability. This advantage often makes the difference between highly profitable dust recovery and a break-even operation. Buell Combination Systems, as well as Cyclones and "SF" Precipitators, are described and illustrated in detail in a booklet, "The Collection and Recovery of Industrial Dusts."

Buell Classifying Systems are unique in operation, combining high efficiency with low power consumption and moderate capital investment. Patented features permit the separation of dry fine powdered or fibrous material from coarse material within a usual fine product range from 10 to 400 mesh. Systems are built in many sizes to handle from 100 pounds to 100 tons of feed product per hour without restriction on particle size or temperature. There are no moving parts. Power requirements vary from 0.04 to 0.5 fan hp per ton of feed per hour. A complete technical discussion is in a folder, "New Buell High Efficiency Classifying Systems."

•

For full information on the application of Buell equipment to your plant's dust problems, write Dept. 18-G. Buell Engineering Company, Inc., 123 William St., New York 38, N. Y.

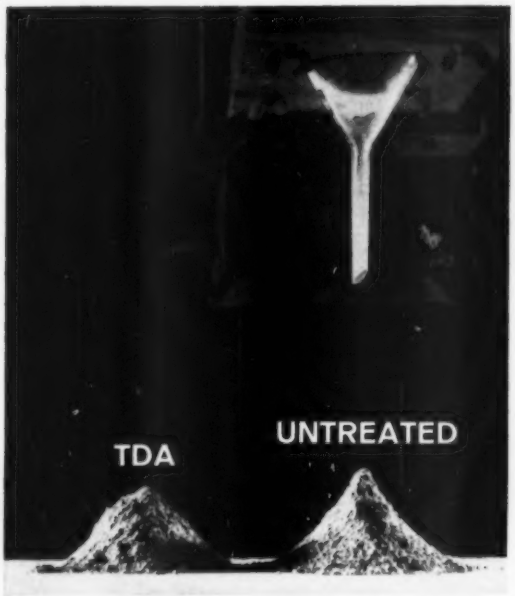


buell®

Efficiency in **DUST COLLECTION SYSTEMS**

How to save up to $84

unloading a car of cement



Laboratory test demonstrates dry-dispersion characteristics of TDA-treated cement. Here, cement samples poured from mechanically-vibrated funnels under closely controlled laboratory conditions are graded by their resulting slope, or "angle of repose." The lower slope of TDA-treated cement signifies greater dispersion, lower resistance to flow.

Two able-bodied men should be able to unload a hopper-car of cement in an hour or two. But if the load has become compacted or pack-set en route, the same job may take two days . . . 32 man hours, at $3 per hour!

There's a practical way to beat the problem. The answer is Dewey and Almy's TDA, a cement dispersant which makes cement flow easily and smoothly. In fact, tests show that TDA cement is 6 times easier to start flowing than untreated cement.

TDA is also a *grinding aid* which can increase mill output 10-50%, depending on conditions. When you consider this combination of benefits, doesn't it make sense to evaluate the use of TDA in *your* cement?

W. R. GRACE & CO.
DEWEY AND ALMY CHEMICAL DIVISION
Cambridge 40, Mass.

Dewey and Almy Chemical Division, W. R. Grace & Co.
622 Whittemore Avenue; Cambridge 40, Massachusetts
Attention: Rock Products Chemicals Department

☐ Please forward the new TDA "Pack-Set" Bulletin

☐ Please make arrangements for your engineer to assist in a full-scale test grind at our plant.

NAME .....
TITLE .....
COMPANY .....
ADDRESS .....
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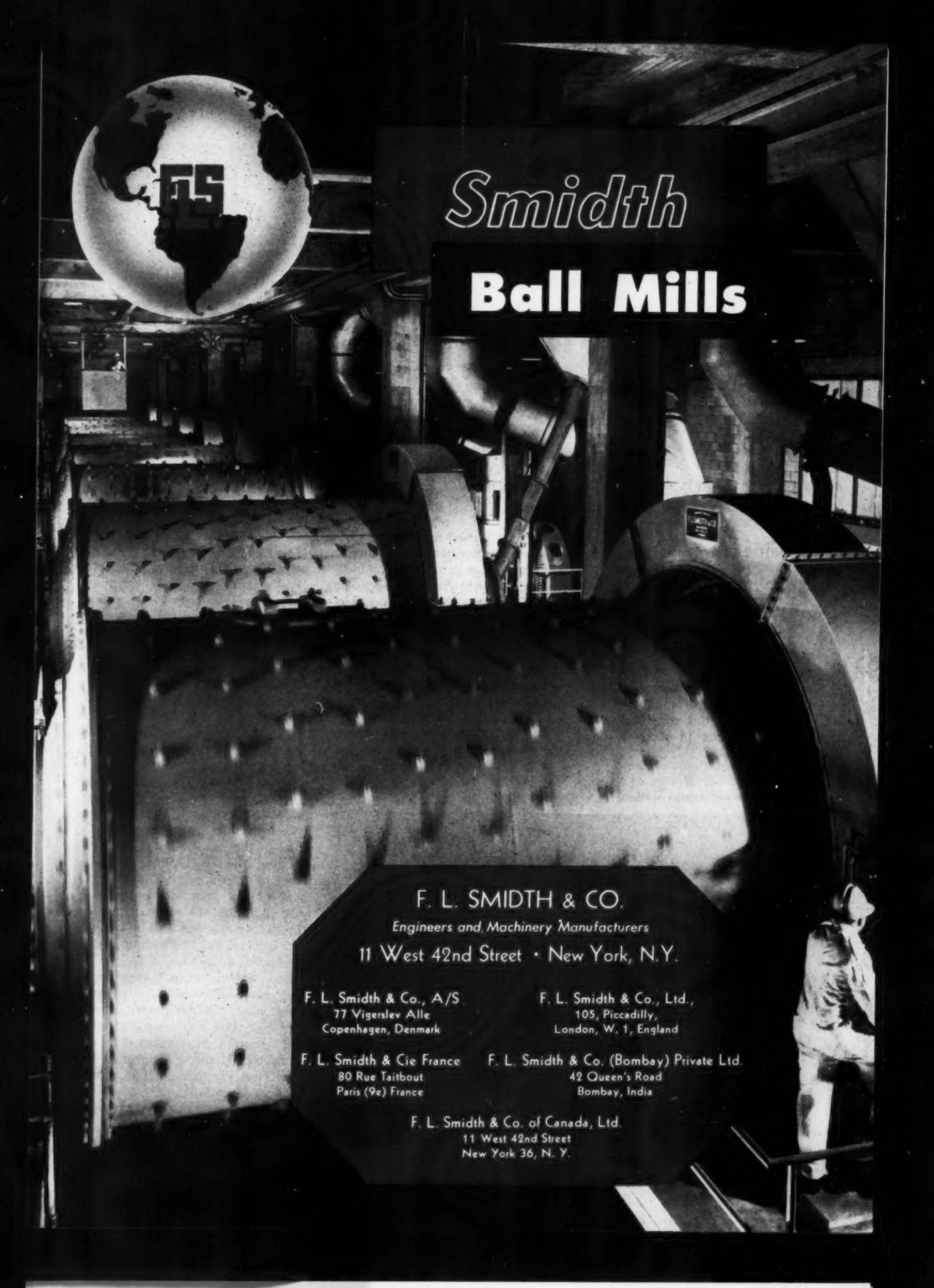
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Washington-Baltimore cement market tapped by Alpha's

By WALTER E. TRAUFFER

ANOTHER ON THE SPOT REPORT

ALPHA Portland Cement Company's new $17,500,000 plant at Lime Kiln, Md., takes its place as one of the most efficient wet-process operations in the industry. The raw material deposit and location offer no unusual problems, and no unusual methods or equipment are used. Instead, this plant uses the latest advances in methods and equipment proved in the company's plants and elsewhere. It is notable particularly for its modern, compact design, its attractive appearance, the use of concrete wherever possible, and the simplicity of its flow sheet. It was designed to produce 2,250,000 bbl. annually of standard (Type I) portland cement but can make all types of standard cement and mortar cement.

This plant came into being because the company's closest existing plants, at Manheim, W. Va., and Martins Creek, Pa., could reach the increasingly important Baltimore-Washington area only by rail hauls exceeding 150 miles. Rather than enlarge these plants to meet the growing demand, it was decided to build a new plant in a location having good access to this metropolitan area. The 1,000-acre site at Lime Kiln, five miles south of Frederick, Md., was selected because of the excellent raw material available, the proximity to the major markets, and the excellent railroad connections.

In each of the two quarries a 2½-cu. yd. electric shovel loads into 17-ton diesel trucks.

After thorough core drilling of the property had been done, it was purchased in February, 1956. Ground was broken in September, 1956; the first of the two kilns was in operation on May 26, 1958; and the first cement was shipped on July 7, 1958.

From the start this plant was designed to be not only an efficient producing unit but also an asset to the community. Every effort is made to furnish a quiet and dustless operation. Starting at the quarry, blasting procedures minimize vibration and noise; all equipment creating noise or dust is under roof; and all dust sources are connected to dust collectors. Highly efficient stack dust collectors are used for kiln exhaust gases. Plant buildings are of concrete construction and have massive, yet attractive architectural lines. The plant site is landscaped with grass

New Maryland Plant

2,250,000-bbl. wet process operation distinguished by efficiency, economy, cleanliness, safety

lawns, flower beds, and young trees. A sewage disposal system is used which fully meets all the health regulations of the state of Maryland.

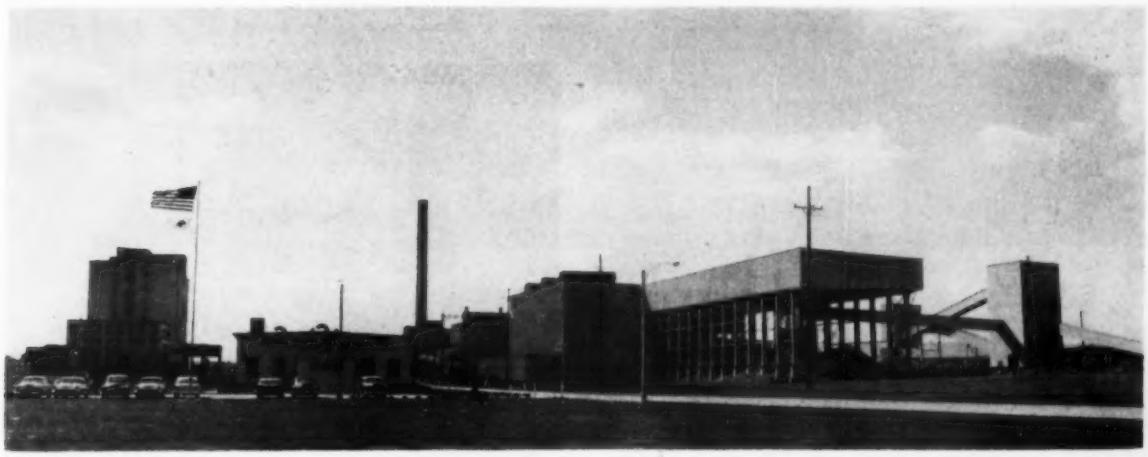
Every precaution is also taken for the safety of the workers and the equipment, and for the workers' comfort. The plant is well lighted; and the lights on the grounds are controlled by a solar switch.

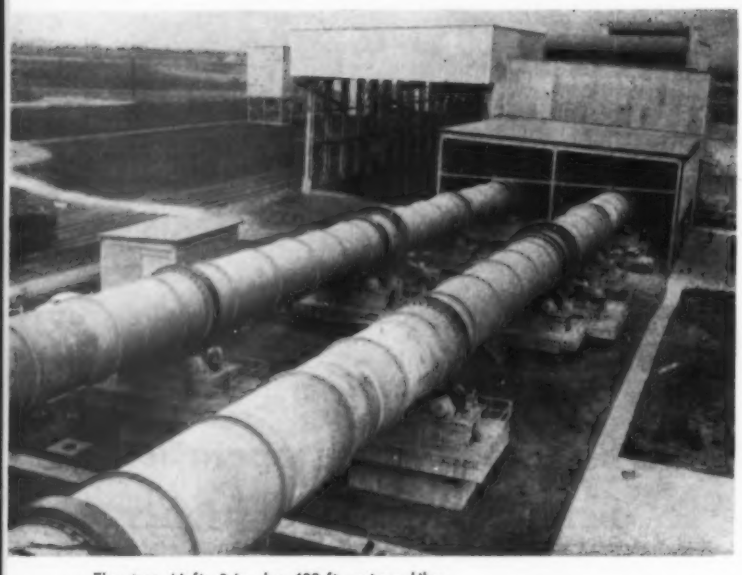
Wherever possible in this plant, all material handling is remotely controlled through pushbuttons and control boards in each department, including the packhouse. As a result this is the company's most efficient operation in terms of man-hours. The total payroll is only 135 men, including the office, the supervisory staff, and the quarry, where 8 men are now doing the drilling. There are 89 men on the day shift and 12 on each of the two night shifts when everything is operated except the quarry, the crushing-and-screening department, and the cement shipping department. The plant operates on a 40-hour-per-week basis, with certain departments running 24 hours per day and 7 days per week. In these departments the employees will work three 8-hour shifts, 5 days per week on a rotating shift basis.

The packing and loading department is designed for quick loading and a small number of man-hours. More than 7,000 bbl. of bulk cement is presently being loaded in 8 hours with three men, and this rate will be improved. Shipments are made over the B. & O. main freight line, with connections in all directions.

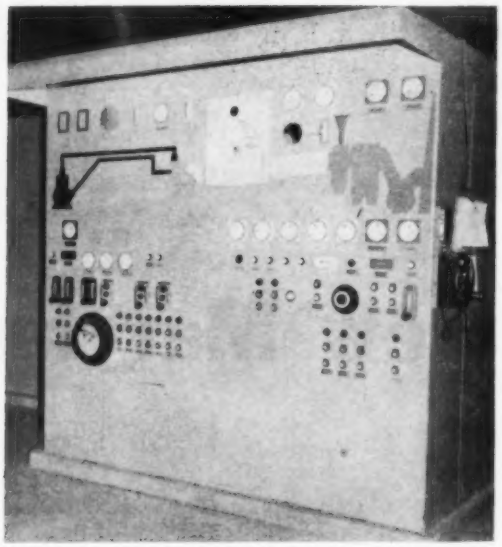
In designing the plant every advantage was taken of the natural terrain and underlying rock profile. Actually, the original design was altered somewhat in order to do this. For example, the crusher pit was put in a low spot in the rock, so that little rock excavation was necessary. At the kilns a natural ground slope

A general view of Alpha's new 2,250,000-bbl. plant at Lime Kiln, Md. At the left is the office and at the right the screen house. The raw end of the storage building is in center foreground.





The two 11-ft. 3-in. by 400-ft. rotary kilns. The clinker end of the storage building and the finish grinding building are beyond the kilns.

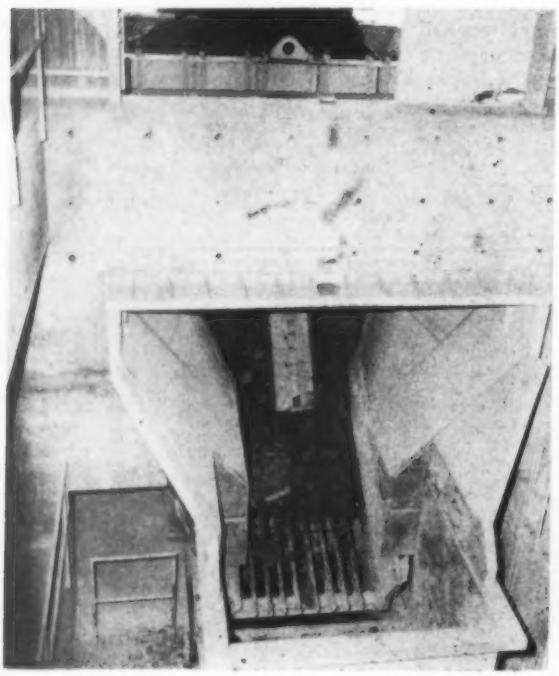


The kiln control board with its full complement of analyzing, recording, indicating, and controlling instruments. The use of colors makes the flow diagram easy to follow.

up toward the feed end provided adequate but even clearance under their full length. The silos rest on solid rock.

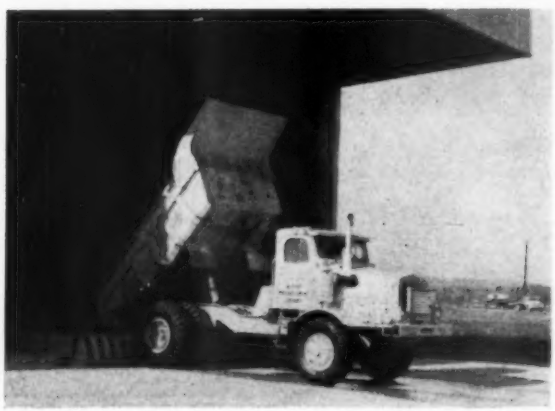
Quarry The deposit is the Frederick limestone, which is widely used for crushed stone and lime manufacture in this area. It varies moderately above and below the desired mix content. Approximately the desired blend is obtained by quarries in two different locations, which will eventually be joined. The overburden, largely clay, varies from 5 to 25 ft. in depth and is removed by a 21-cu. yd. Euclid scraper. Most of this material is stored on the property for later use but enough is left on for the desired mix and shot down with the rock. Sand from a seam at one side of one quarry is also dug out and stored for use. It is loaded into trucks by a 2½-cu. yd. P&H shovel which is also used for cleanup stripping.

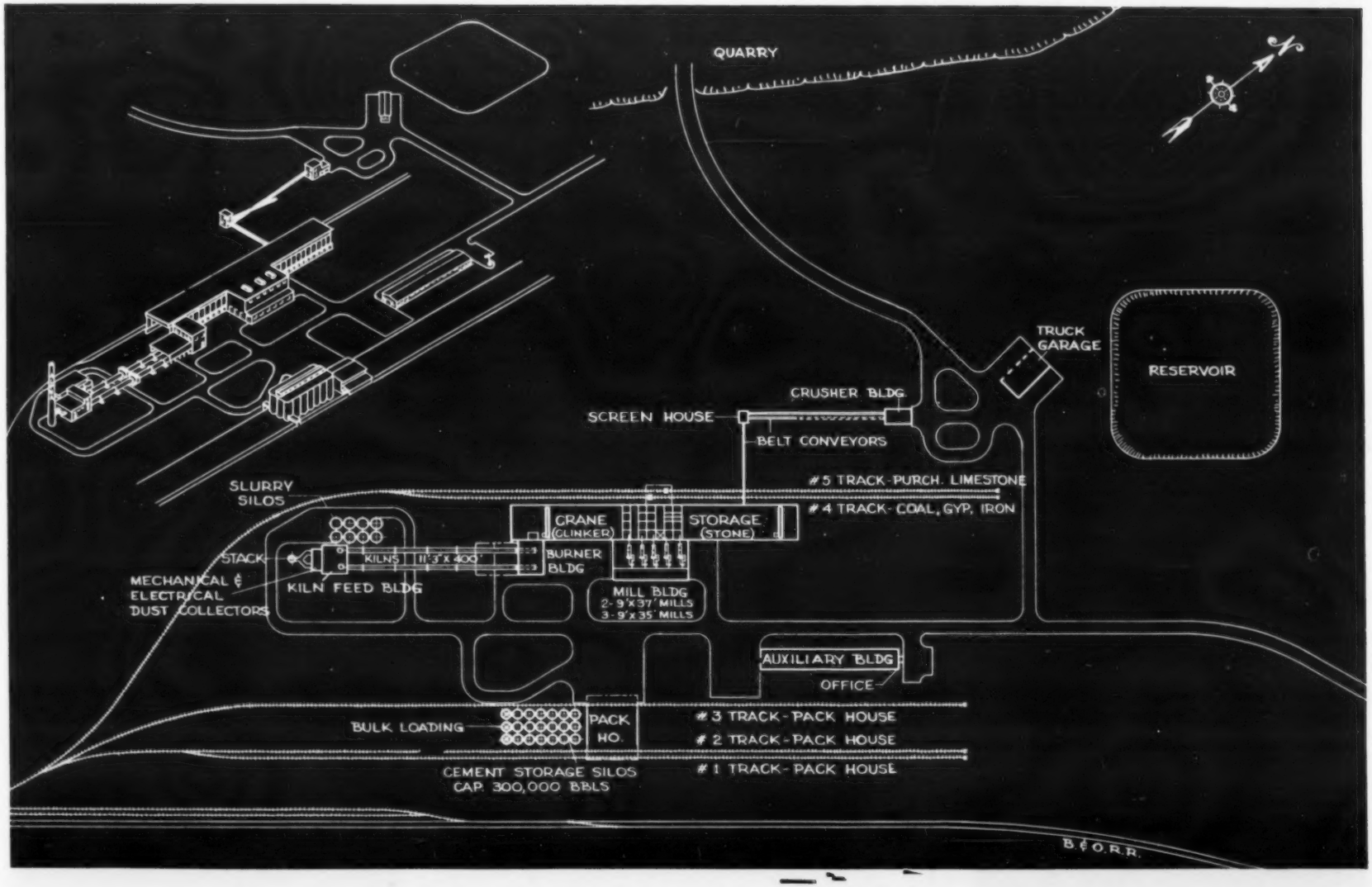
Both quarries are still under development and will eventually have 80- to 90-ft. faces. Drilling is now being done with four Gardner-Denver Airtrac mounted drills. The



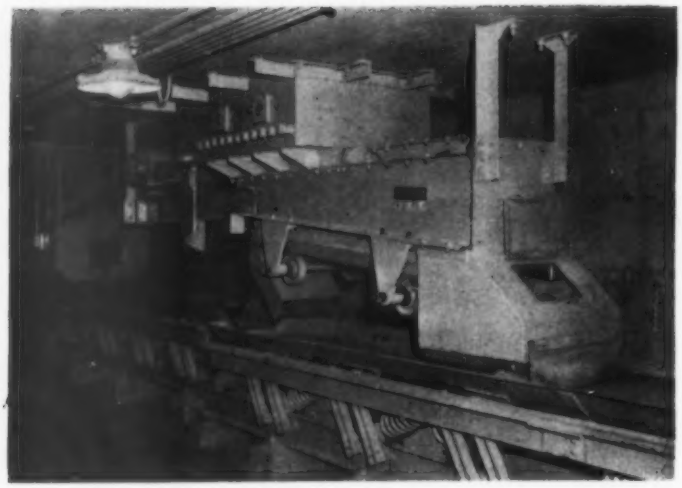
Left: The 450-t.p.h. electric vibrating feeder, with attached bar grizzly, over the primary crusher.

One of the eight 17-ton diesel trucks dumping a load of stone to the feeder ahead of the primary crusher.





General layout of Alpha Portland Cement Company's Lime Kiln, Md., plant.



Some of the feeders which proportion limestone, clay, and other materials onto the vibrating conveyors ahead of the raw mills.

3½-in. holes are spaced 9 by 9 ft., and shots average three rows of 33 holes each. 40 percent Red Cross Extra dynamite is now being used with Primacord and millisecond delay caps. Yield is averaging 2½ tons of stone per pound of explosive. A 6,000-lb. Cape Ann dropball is used for secondary breakage, which is handled by a Marion-Osgood rubber-tired crane that shuttles between both quarries. To make sure that blasting vibration is held down to reasonable levels, a Vibration Engineering Co. seismograph made by the W. F. Sprengnether Instrument Company is used to record blasts. The Vibration Engineering Company checks all records regularly and advises on the results.

Loading of the stone is done by a 2½-cu. yd. Marion electric shovel in each quarry. A fleet of eight 17-ton Euclid diesel-powered rear-dump trucks hauls from both quarries to the plant. The plant is at present 1,300 ft. from one quarry and 2,500 ft. from the other.

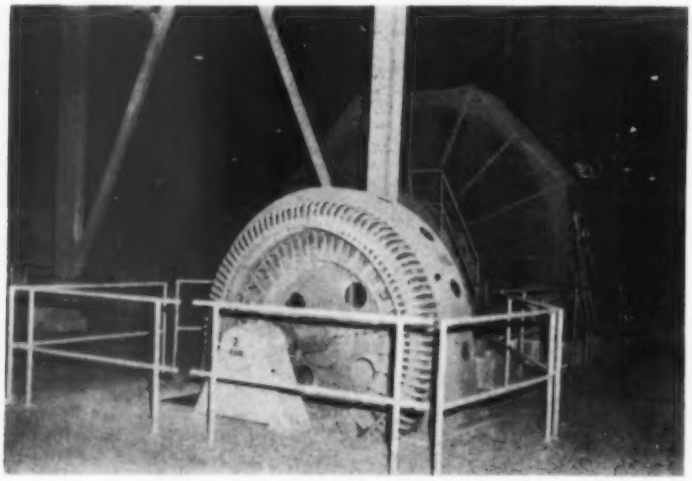
Crushing-Screening The trucks dump their loads onto a 5- by 10-ft. Syntron 450-t.p.h. electric vibrating feeder with a tapered hopper. To this is attached a 5-ft. by 6-ft. 6-in. bar grizzly with 5-in. spacing. Oversize goes to the 48- by 60-in. Traylor Type HB jaw primary crusher, which is driven by a 250-hp. motor. Minus 4-in. material through the grizzly cushions the fall of the minus 5-in. crusher product on 48-in. by 365-ft. belt conveyor No. 1 to the secondary crusher building. There the stone is discharged to the Pennsylvania CD 1750 Impactor secondary crusher, which has 12 325-lb. hammers and is driven at 890 r.p.m. by a 700-hp. motor. This unit reduces 90 percent of the stone to ¾-in. size or less. Its product is carried on 42-in. by 207-ft. and 185-ft. belt conveyors No. 2 and 3 to a pair of 5- by 14-ft. Tyler Ty-Rock screens. All material over ¾-in. size is returned by gravity to the Impactor. Minus ¾-in. stone is carried on 30-in. by 209-ft. belt conveyor No. 4 to the storage area.

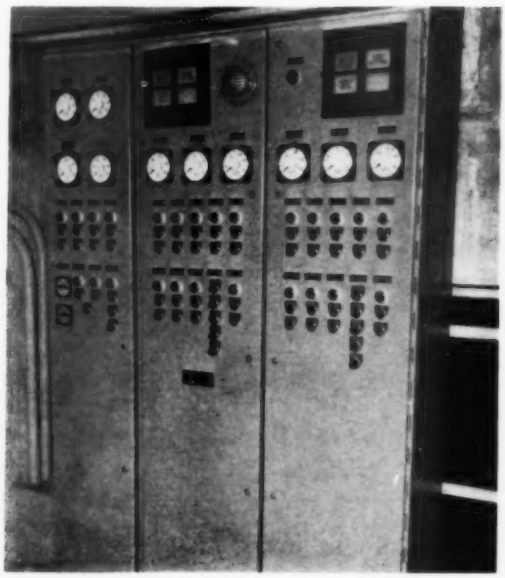
Material discharged from this belt is sprayed with water to hold down the dust. A solenoid automatically stops the sprays when the material flow stops. All dust points in the primary and secondary crusher buildings are connected to three Norblo automatic dust collectors.

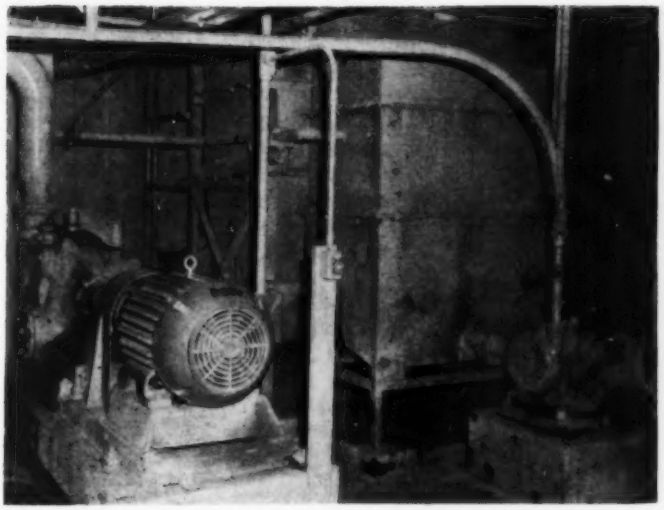
Materials Storage The covered storage building is 80 ft. wide by 680 ft. long and is used to store and reclaim all materials used. Two P&H overhead traveling cranes with 4-cu. yd. Blaw-Knox clamshell buckets handle these materials to and from storage. Indi-

Right: The control board for the raw-grinding mills.

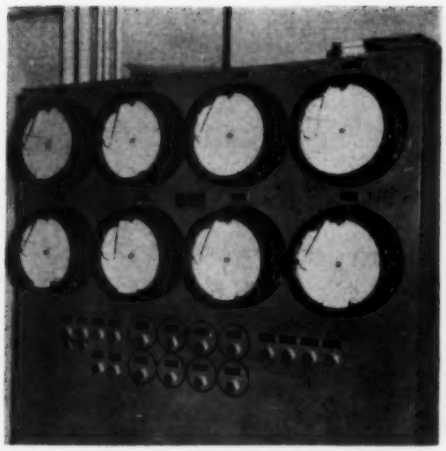
The two 9- by 37-ft., 3-compartment raw-grinding mills, with one of the 1,250-hp. synchronous motors in foreground.







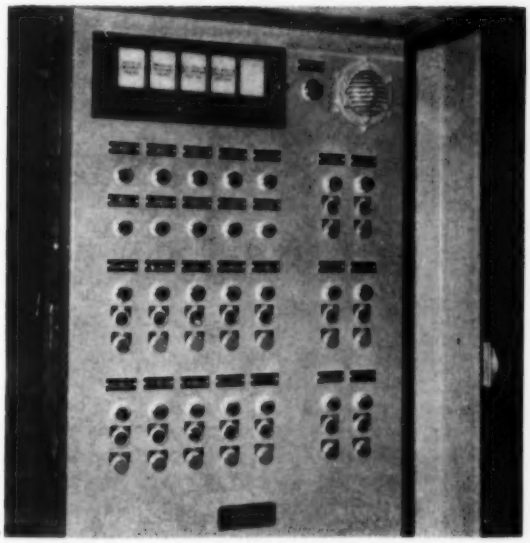
Slurry screens and pumps under one of the raw mills. The small pump returns coarse material to the mill.



The control board with slurry level indicators and recorders under the slurry blending tanks.

vidual sections can store 21,000 tons of raw stone, 10,000 tons of sweetening stone, 3,600 tons of gypsum, 500 tons of sand, 500 tons of iron, 4,500 tons of coal, and 100,000 bbl. of clinker. (There is also a 225-ton storage for shale which is not now being used.) About 10 percent of this very high calcium stone is used in the mix. It is obtained from several sources within 50 to 100 miles.

Sand, iron ore, shale or clay, coal, and gypsum are all received at one unloading station. Car unloading on two tracks is facilitated by Allis-Chalmers car shakers. A reciprocating feeder discharges from the track hopper to a bucket elevator. One screw conveyor feeds sand, shale or iron ore to storage, another handles coal and gypsum to storage.

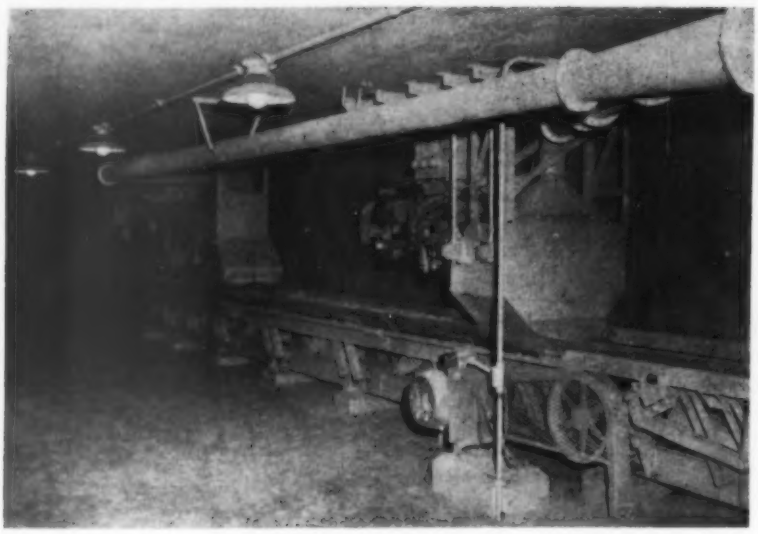


Right: The control board for the return of dust from the stack collectors to the kilns.

Below: The two 11-ft. 3-in. by 400-ft. kilns with tanks for collected stack dust (left).

Raw Grinding The crane rehandles rock, ore, and sand to two sets of five 343-ton raw mill feed bins. The other two bins in each set are used for shale or clay and for purchased limestone. This limestone is stored in a separate storage bin, from which a Jeffrey vibrating feeder discharges to a Pennsylvania Impactor crusher. The crushed stone is carried on a Carrier vibrating conveyor to a bucket elevator, and by screw conveyor to the two mill feed bins.

Under each of the two sets of mill feed bins are feeders which automatically shut off when any one of these fails to function. There are Link-Belt reciprocating feeders with



One set of clinker and gypsum feeders and the oscillating conveyor to one of the three finish mills.

P.I.V. variable-speed drives for the two limestones and Hardinge constant-weight feeders for the other three materials. The two stones, the iron ore, and the sand are discharged in the desired proportions on two Carrier vibrating conveyors in series.

Water is added as the raw material mix is discharged to the drum feeders of the two raw grinding mills. These are 9- by 37-ft. 3-compartment Allis-Chalmers tube mills, each driven at 18 r.p.m. by a 1,250-hp. Allis-Chalmers synchronous motor through a Stearns magnetic clutch, which gives a gradual starting load. Each mill carries a 114-ton load of carbon-manganese forged steel grinding balls — 32 tons of 3- to 2½-in., 39 tons of 2- to 1½-in., and 43 tons of 1½- to 1-in., in compartments 1, 2, and 3, respectively.

Slurry discharged from these mills is ground to a fineness of 87 to 90 percent through 200 mesh and has a 35 percent water content. Output averages about 50 tons per mill per hour. This is discharged over 4- by 5-ft. Tyler Hum-mer screens which remove all materials larger than 50 mesh. These spitzers are returned by two 1-in. Wilfley Model K pumps to the feed ends of the mills. All the slurry passing through both screens is pumped by two 5-in. Wilfley pumps to six of eight storage tanks.

Slurry Blending The eight slurry tanks are each 29 ft. in diameter by 30 ft. high, with a capacity of 19,000 cu. ft., and have Dorr mechanical and air agitators. Under the supervision of the laboratory, which is below the tanks, slurry from the six storage tanks is pumped by 5-in. Wilfley pumps to the two blending tanks. These are further checked, and further blending can be obtained when pumping to the two final or kiln feed tanks. If desired, the slurry can be blended direct from the four storage tanks to the other four tanks for kiln feed.

In the office a Foxboro control board has indicators for slurry levels, and for the levels over a 24-hr. period. This shows the rate of usage and the blend and also provides a check for later use.

Two 6-in. Wilfley pumps (one in reserve) feed the blended slurry to the two constant-level kiln feed tanks. The latter have Allis-Chalmers ferris-wheel feeders with P.I.V. variable-speed drives, and their variable-speed motors are interlocked with the kiln drive motors to maintain a constant feed ratio. Any overflow from these tanks goes by gravity back to the kiln-feed tanks. At each kiln feed spout there is a vortex mixer for blending in dust from either the mechanical or electrical exit gas dust collectors, or both, if desired.

Kilns The two 11-ft. 3-in. by 400-ft. Allis-Chalmers rotary kilns are mounted on six sets of rollers and are inclined ⅜ in. to the foot. Each is being driven at the rate of 60 r.p.h. by two variable-speed motors. These are 60/75 hp., 300/1,200 r.p.m., and are connected by a Link-Belt reducer to the kiln girth gear. An Allis-Chalmers gasoline engine provides standby drive.

Both kilns are equipped with a 60-ft. chain system of the company's own design, of the helical suspension type. The system contains a total of 7,425 ft. of chain, made with links of 1-in. diameter steel, weighing about 45 tons. These chains are tied direct to the kiln shell by special hangers, and no brick is used in this section. Beginning at the discharge end of the kiln there are 10 ft. of 40 percent alumina brick and 5 ft. of 70 percent. Then, in the burning zone, there is 50 ft. of Magnecon, followed by 25 ft. of 70 percent and 25 ft. of Spallac super-duty. All of this is 6-in. brick. Next are 134 ft. of 4½-in. Armstrong A-23 and 50 ft. of 40 percent alumina. There is no lining for a distance of 84 ft. at the chain section and 16 ft. at the feed end.

Clinker The clinker is discharged from each kiln into a No. 637 Fuller 3-compartment horizontal grate clinker cooler. This unit has a 47,000 c.f.m. New York blower fan and a Multiclone collector from which dust is returned to the last section of the cooler. Clinker is discharged through a hammermill breaker, and the dust through the grate by a drag chain conveyor, to a 24-in. Carrier conveyor, which serves both coolers. This conveyor discharges to a clinker pit in the storage, from which one of the cranes rehandles to storage. The crane also reclaims from storage to the finish mill feed bins.

Fuel The fuel used is 14,000-B.t.u. West Virginia low-ash, low-sulphur bituminous coal. This is ground in No. 573 Raymond direct-firing bowl mills to a fineness of 97 percent through 100 mesh and 98 percent through 60 mesh. This, with primary air at a temperature of 150 deg., is fed into the kilns through a 12-in. diameter burner pipe. Drying air from the cooler, *via* a cyclone collector to remove the dust, is tempered to about 600 deg. F.

Coal is fed by a vibrating feeder from the 1,000-ton storage bin to a Carrier conveyor, followed by a bucket elevator and a series of three screw conveyors. From the last screen the coal is discharged into the two 50-ton feed hoppers over the coal mills. Upper and lower level Bindicators automatically control the entire circuit. In stopping the coal flow, the feeder under the main coal bin shuts off 5 minutes before the conveying equipment in order to give time to unload.

Exit Gases Hot gases (600 deg. F.) are drawn from each kiln through a dust chamber and flue to a Research Cottrell Cyclo-Trel mechanical dust collector with two sets of 12/24-in. tubes. This unit removes 60 to 70 percent, by volume, of the dust. The flue and collector are insulated to prevent condensation. The gases then go to a Research Cottrell electrostatic precipitator of standard design, having two parallel units of four compartments each. This precipitator is guaranteed to remove 95 percent, by weight, of all the dust entering it. The draft fan is a Robinson Type A double-inlet unit rated 140,000 c.f.m. at 7 in. of water pressure suction. Both fans vent to atmosphere through a 300-ft. Rust reinforced concrete stack which is 33 ft. in exterior diameter at the base and 19 ft. interior diameter.

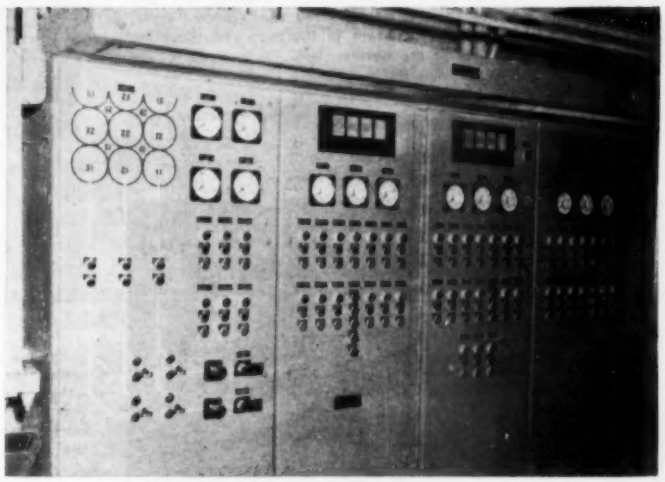
The dust reclaiming system from the mechanical and electrical collectors consists of a series of 10-in. screw conveyors and two bucket elevators so arranged that any desired part of the dust can go to the kiln or be wasted. There are separate bins for both dusts for truck loading to waste, and the dust in either can, if desired, also be fed to the kiln.

Kiln Control In controlling the kiln, the back end temperature is held as close as possible to 600 deg. F. Drafts are held as close as possible to 1 in. at the inlet to the coal mill, 0.10 in. in the kiln hood, and 1½ to 2 in. at the back end. The primary air pressure is kept between 10 and 15 in. in order to extend the burning zone. The operator varies the coal feed at present, but the best combination of temperatures, drafts, and speeds is still being ascertained. Other temperatures average about 900 deg. overgrate in the coolers, 175 deg. in the coal mills, 2,800 deg. in the burning zone, and 500 deg. or less at the stack.

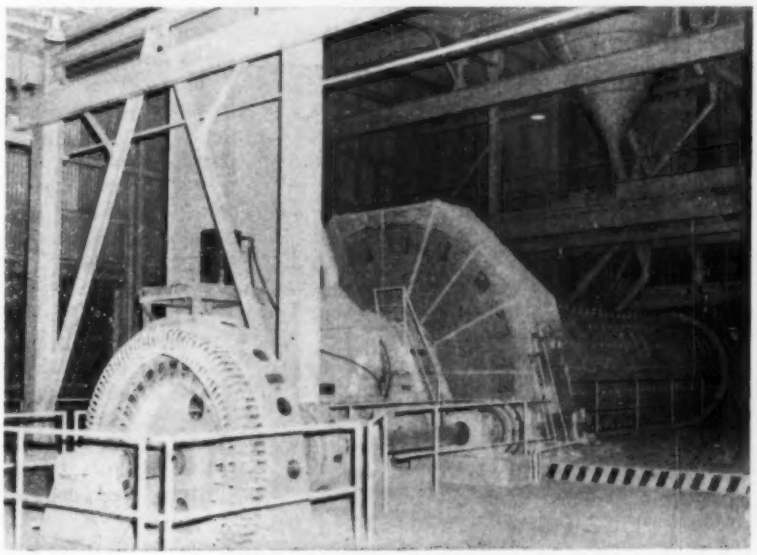
Even so, the two kilns are averaging close to their designed combined capacity of 6,500 bbl. daily of Type I cement. This is done on 90 lb. of coal or 1,260,000 B.t.u.'s per bbl., a figure which is also expected to improve. Little ring trouble has been experienced and this is taken care of by the occasional use of a kiln gun.

Each kiln is controlled from a Bailey Meter Company board and cubicle which has all the usual instruments, including a Bailey oxygen analyzer; temperature indicators and recorders for 12 points in the kiln, the cooler, the coal mill, etc.; draft indicators for the same; ammeters; speed indicators; etc.

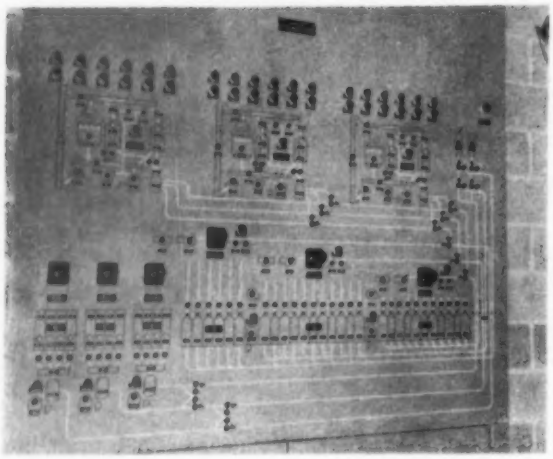
At present, control is manual; but all controls will be changed to automatic except the coal feed. On the flow diagram on the kiln board a color scheme is used which was



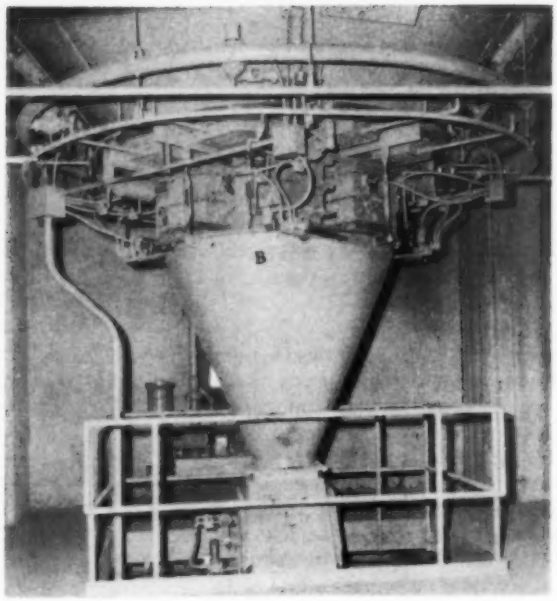
The control board for the three finish grinding mills. The diagram and lights at the left show the flow of finished cement to the storage silos.



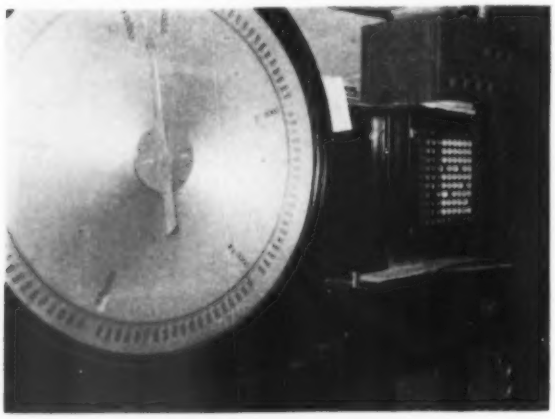
One of the three 9- by 35-ft. 3-compartment finish mills with the 1,250-hp. motor in foreground and the 16-ft. separator in the background.



The diagrammatic control board for the storage, packing, and bulk loading of cement. The silo controls are at the bottom, right; those for the three packing systems are at the top; and those for the three bulk-loading silos at the bottom, left.



(Right) The gates and controls under one of the 4-compartment bulk-loading silos.



Left: The automatic scales for quickly weighing carloads of bulk cement. The control board is at the right.

The flexible conveyor systems used for loading bagged cement into cars.

especially helpful in breaking in new burners. Black is used for firing and coal, brown for cooling, yellow for the kiln, green for the kiln return dust feed, grey for the stack dust collector; and the appurtenances of each, with their related instruments, are the same colors.

Finish Grinding There are two feed bins for two of the three finish-grinding mills and three for the other. These are for clinker and gypsum, and the third for limestone for masonry cement manufacture. There are Link-Belt reciprocating feeders for clinker and limestone, and Hardinge constant-weight feeders for gypsum feeding to Carrier conveyors for each grinding circuit. When air-entraining cement is being made, Vinsol resin is added at the conveyor by a small Denver ferris-wheel feeder. Other additives include oleic acid for masonry cement.

In each of the three circuits the clinker and gypsum are discharged through the trunnion of the 9- by 35-ft. Allis-Chalmers 3-compartment mill. Each is driven at 18 r.p.m. by a 1,250-hp. Allis-Chalmers synchronous motor through a Stearns magnetic clutch. The ball load in each mill is the same as in the raw mills.

The product of each mill is discharged by a short 16-in. Airslide

to a bucket elevator and a 14-in. Airslide feeds into the 16-ft. Sturtevant separator. Oversize goes by gravity back to the feed end of the mill. The separator is vented through a No. 756A Norblo automatic bag type collector to the atmosphere. In the two standard circuits the dust collector product is carried by an Airslide, and the separator product goes by gravity to a long screw conveyor and to an 8-in. Fuller-Kinyon pump which feeds to storage. Grinding is done to a fineness of 95 to 96 percent through 200 mesh or 1,850 sq. cm. per gm. for standard (Type I) portland cement.

In the third mill circuit the collector product goes *via* a series of two Airslides, and the separator product goes direct, to the same 8-in. pump when standard cement is being made. When masonry cement is being made, this product goes to a separate 7-in. Fuller-Kinyon pump.

Cement Storage The cement lines pass from the mill building to the storage silos through a concrete tunnel, which also houses the power lines. The cement lines feed direct to the storage silos. There are 18 silos (28 ft. in diameter by 110 ft. high) arranged in three rows, which, with their 10 star bins, have a total capacity of 300,000 bbl. At one end, and slightly separated from the others, are three 4-compartment bulk loading silos (28 ft. in diameter by 55 ft. high) each having a capacity of 8,000 bbl. The 18 cement silos are vented to atmosphere through two Sly Dynaclone dust collectors.

The 18 regular silos have conical steel hopper bottoms. Under each of the three rows is a self-propelled 8-in. Fuller-Kinyon pump which can feed either to the three bulk-loading silos or to the packhouse.

Packing For packing, the cement goes first to an alleviator bin for each of the three packing systems. This bin vents to a Sly No. 4 Dynaclone dust collector. Cement from the alleviator drops direct, and that from the dust collector goes *via* a return screw conveyor into a pair of overflow bins. These are equipped with upper and lower level indicators. They discharge, *via* short Airslides, to the screw conveyor which also collects the spill from the packer and the bag handling conveyors. A bucket elevator discharges this cement over a Productive Equipment screen—for lump removal—to the return screw already mentioned. This screw discharges it into the packing bin. Any cement not needed goes on through the screw and is discharged into the overflow bins.

The bags are discharged from the three 4-tube St. Regis packers, each of which has its own handling system for loading cars or trucks on either side of the packhouse. A short belt conveyor with a dropoff turnover arrangement feeds the bags at right angles to a stationary reversible conveyor which has a flexible conveyor at each end for loading into cars or storage. These are all Power Curve conveyors. Shipping is by rail and truck.

Bulk Loading In bulk loading, the cement also goes from the silo to alleviator bins over each of the three 8,000 bbl. bulk-loading silos, each of which vents to a Sly Dynaclone dust collector. The cement from each of the bins discharges direct, and that from the dust collector *via* an Airslide, to a turnhead over one of the silos. This turnhead, with limit switches for accurate positioning, controls discharge into the four quarter sections of the silo. This arrangement permits storing four types of cement in each silo, if desired, without any possibility of their becoming mixed. The turnheads are controlled from a panel in the packhouse office.

Loading operations are also push-button-controlled from the office. Cement can be drawn from any of the four sections of each silo through a rotary feeder. From each silo two 16-in. Airslides allow loading to railroad cars on both sides of the silos. This makes it possible to load three cars at one time. Four Dynaclone collectors keep this operation dustless. Loading is done through a drop chute and flexible rubber hose. On one track on either side there is the 70-ft. platform of a 125-ton Fairbanks-Morse scale on which the car is loaded. Cars have been loaded at the rate of 5 (2,000 bbl.) per hr. The scale weights are automatically recorded and printed on loading tickets. A Whiting Trackmobile is used for shifting cars.

For the convenience of the workers there is an 1,800-lb. capacity Otis elevator to the top of the silos. The packhouse has a 7,500-lb. capacity Otis freight elevator.

Chemical Control The chemical control methods follow the company's general practice. The usual tests are made of all raw materials. There are automatic sampling devices on the raw and finish mill streams, and samples are taken every hour. Blended slurry and clinker samples are also taken. The laboratory is fully equipped, including a Perkin-Elmer flame photometer, a Tatnall compression testing machine, a Riehle tensile tester, an American autoclave, a moist closet, etc.

Power Public utility power is purchased at 32,000 v. from the Potomac Edison Company and is reduced by the company's 7,500 kv.-a. transformer to 4,160 v. It goes to the main panel in the mill room and thence to the nine load centers throughout the operation. The 4160 v. current is used for all motors of 250 hp. and over; 440 v. is used on the others.

Water Most of the water used in the plant is drained from the quarry, but there are also three deep wells with 250-, 100- and 100-g.p.m. Deming pumps. These feed to a 6,500,000-gal. reservoir of earth-fill construction with a 4-in. Gunite reinforced shell. All cooling water is usually returned to the reservoir. There is also a 50-ft. diameter tank under the pumps, and in the dry season both fresh and return water goes to the tanks. The two pumps at the reservoir are 400-g.p.m. Deming units. In addition to the regular pumps at these two locations there is also a 750-g.p.m. gasoline-engine-driven pump at the reservoir for emergency use.

Construction Concrete was used wherever possible in the construction of the plant. Reinforced concrete is used for all heavy construction, including foundations, footings, the slurry and cement storage silos, etc. Prestressed beams and precast slabs were used in the office building, machine shop, storehouse, washrooms, and quarry garage. Corrugated asbestos siding

also was widely used. The mill building and the kiln feed and burner buildings have Robinson ventilated roofs and no windows. All of the main roads on the property are 12-in. unreinforced concrete, with sawed expansion joints.

The thoroughness of detail in the design is evident in the use of hoists over all pieces of equipment which will require handling. Electric chain hoists of 1- to 10-ton capacity are used for heavy handling, and small chain hoists elsewhere. In the mill room a 10-ton overhead traveling crane is used, among other things, for charging the mills with grinding balls.

General The safe and efficient design of this plant was a co-operative effort between Alpha's Engineering staff, which designed the flow and equipment layout, and the Macdonald Engineering Company, the general contractor, which did all the building design, poured more than 50,000 cu. yd. of concrete (including the slurry and cement silos), and erected the equipment. Subcontractors did the electrical installations, the plumbing, the steel erection, etc. Every stage of construction was planned in advance, and as a result everything went through as planned; a little overtime had to be paid. This planning helped to hold the plant cost to the relatively low figure of $5.70 per bbl., exclusive of land.

Most of the heavy equipment was supplied by the Allis-Chalmers Mfg. Co., including the kilns, the raw- and finish-grinding mills and most of the electric motors. The belt conveyors are Hewitt-Robins, with Boston Woven Hose belting; the screw conveyors are Continental Gin; and Jeffrey and Link-Belt elevators are used. All belt conveyors are driven through Falk reducers and V-belts. Farval automatic lubrication is used on the raw- and finish-grinding mills, the coolers, cranes and shovels.

Officers of the Alpha Portland Cement Co. are: J. F. Magee, chairman of the board; R. S. Gerstell, president; N. O. Wagner, senior vice-president; E. F. Brownstead, vice-president, operations; R. L. Rhodes, vice-president, sales, and H. F. Stepanek, secretary-treasurer. D. L. Ziegler is assistant to the vice-president of operations; D. C. Coulson is chief engineer. G. V. Cosgrove is plant manager at Lime Kiln; T. M. Houseknecht, is chemist; and C. R. Smith is plant engineer.

Management Award for 1958 Received by Ideal Cement Co.

Ideal Portland Cement Company was recently awarded a certificate of excellent management by the Audit Committee of the American Institute of Management, New York. This award, for 1958, is the third consecutive one received by the firm.

The management audit is a study of all phases of business operation, including production efficiency, sales vigor, fiscal policies, economic function, corporate structure, and research and development.

Murray Tile Co. Acquired By National Gypsum Co.

National Gypsum Company is acquiring the two plants of Murray Tile Company in Kentucky. The purchase involves about $1,600,000. It will be the fourth major acquisition by National Gypsum in the last nine months and brings to 58 the number of plants operated by the company.

Murray Tile will exchange all its stock for 24,800 shares of National Gypsum's common stock.

Koch Sand & Gravel Company Acquired by Bedford-Nugent

The Bedford-Nugent Corporation recently purchased the Koch Sand and Gravel Company, both in Evansville, Ind., for approximately $125,000. The purchase was made from Producers, Inc., and Beeler Warehouse Corp., both headed by Ferris Traylor, an Evansville contractor.

Since the two sand and gravel company sites adjoin each other on the Evansville river front, sand will be handled at the former Koch site, and gravel at the Bedford-Nugent facility. The combined operations will continue under the Bedford-Nugent name.

Production began recently at the new $8,000,000 sulphur extraction plant at Okotoks, Alberta, Canada. The plant is operated by Texas Gulf Sulphur Company, Devon-Palmer Oils, Limited, and Shell Oil Company Limited of Canada. Annual capacity of the plant will be in excess of 100,000 long tons of elemental sulphur.

May deliveries of more than 100,000 long tons of sulphur by Pan American Sulphur Company reflected an increase in excess of 10,000 tons over April shipments. The May shipment figure is the largest for any single month in the company's history.

Eight senior students of architecture at the University of Virginia and Virginia Polytechnic Institute have won cash prizes totalling $1,500 in the sixth annual Solite Competition Award contest, sponsored by the Southern Lightweight Aggregate Corporation.

A.S.T.M. Reports and Papers Published in 1958 Proceedings

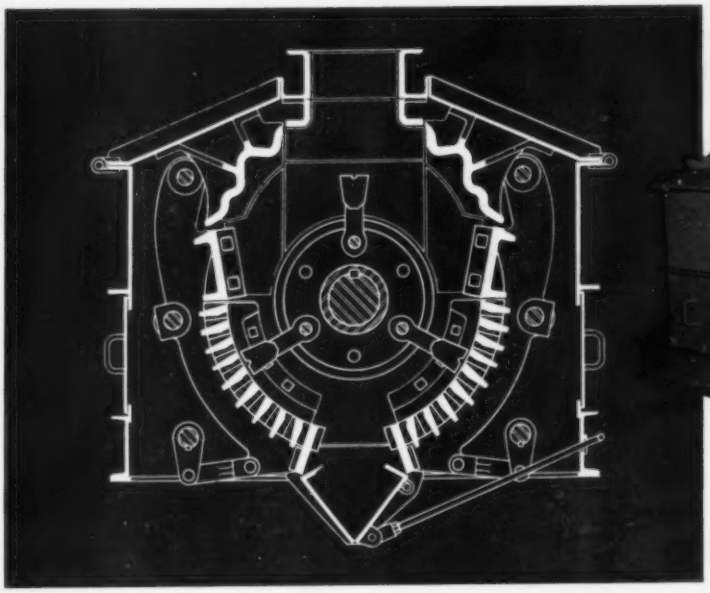
The American Society for Testing Materials announces the publication of its 1958 A.S.T.M. *Proceedings*, Volume 58. The 1,430-page volume, recording the technical accomplishments of the year, includes reports and papers, together with discussions offered to the society during the year and accepted for *Proceedings*.

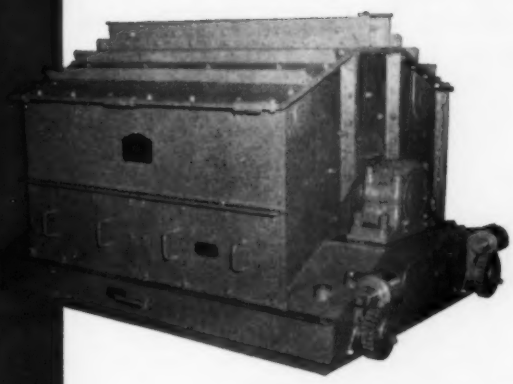
Included are 74 reports of technical committees, together with appendices, 51 technical papers, and discussions on a wide variety of subjects pertaining to research and testing materials.

Copies of the *Proceedings* may be obtained from the American Society for Testing Materials at $12 each.

Contracts were recently awarded for a $2,500,000 addition to the Calgary, Alberta, plant of Gypsum, Lime and Alabastine Limited, Toronto, Ont. The addition will triple current production of plaster, and will house gypsum wallboard, lath, and sheathing facilities.

Forty-three Buffalo, N. Y., employes of Michigan Limestone, a division of the United States Steel Corporation, were recently honored for achieving 1000 consecutive days without a disabling injury.





Here's how the Pennsylvania Reversible Hammermill will help lower your operating costs

As the feed enters the mill it is precrushed in the upper zone by being struck by the hammers in free air, driven against the breaker blocks, ricocheting and struck by hammers again. Only small pieces enter the lower crushing zone for final reduction before escaping through the cage bars. There's no dragging of hammers through oversize in the lower crushing zone. Thus wasteful fines are held to a minimum along with hammer wear and power requirement. The easily adjusted cages assure you a uniform product for the life of the hammers regardless of variance of the physical properties of the rock. The cage adjustment also permits you to wear the hammers much further, and, due to reversibility of the rotor, there is no manual turning of the hammers. Get the complete story of these crushers. Send for bulletin 1034. Pennsylvania Crusher Division, Bath Iron Works Corporation, West Chester, Penna.

Pennsylvania CRUSHERS

Riverside's New Automatic Crushing,

Aerial view of the Oro Grande plant, with the new crushing and blending system at the left. The roads shown lead to the primary crusher; bedded storage is at lower left. Two new kilns are being installed across the plant area and at a considerable distance from the five existing kilns.

By HARRY F. UTLEY

raw materials X-ray-analyzed, blended by electronic computation — raw materials and clinker stored by stackers and recovered by special reclaimers

Storage, Blending Systems

One of the quarry trucks is about to dump into the hopper feeding the 60-in. gyratory primary crusher.

ANOTHER ON THE SPOT REPORT

NEW crushing-storage-blending facilities involving an investment of $5,750,000 went into service this spring at the Oro Grande, Calif., dry-process plant of Riverside Cement Company, a division of the American Cement Corporation. This system is automatically storing, blending, and reclaiming raw materials in a 140,000-ton ground storage. Clinker is similarly to be stored and reclaimed.

Employing horizontally-layered storage beds of raw materials reduced to mill-feed size, reclaiming and blending are effected by a newly-developed machine which makes cross-sectional cuts through the storage areas and delivers to the raw-mill department by belt conveyor. The system also involves two stages of crushing, automatic sampling, and the use of wing-type stackers which build up the layered storage piles.

When it became operative, the new system also shortened the truck-hauling distance from the deposits to the primary crusher by about ¾ of a mile through the extensive use of belt conveyors. The facility was designed and engineered by Hewitt-Robins and the technical staff of Riverside Cement Co.; the Guy F. Atkinson Company of Long Beach, Calif., was the general contractor. Hewitt-Robins also furnished much of the equipment, including the belt conveyors, screens, stackers, and reclaimers.

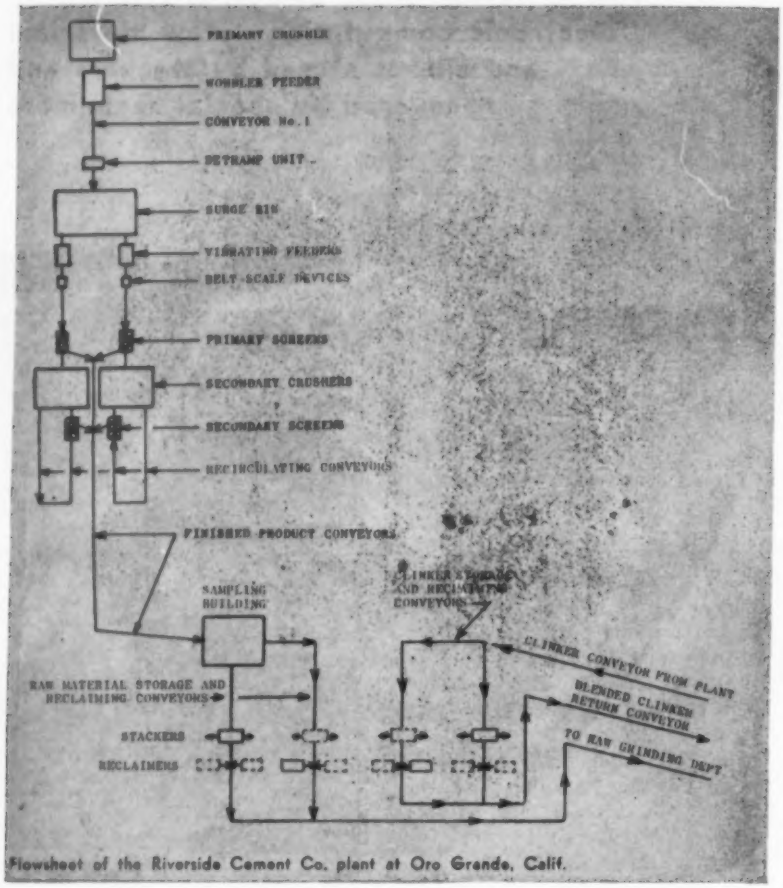
Limestone up to a maximum size of 60 in. and others of the raw components of the mix are delivered in 35-ton capacity LeTourneau-Westinghouse rear-dump trucks and Type B Tournapulls to the 60-in., 350-hp. Allis-Chalmers primary gyratory crusher. Here it is reduced to minus 7 in. and discharged into a surge chamber directly below the crusher. A 12½-in. pitch 13-bar Universal Wobbler feeder with a bed width of 60 in. is located at the surge bin to receive the product. Openings of 3½ in. between the wobbler bars allow throughs to reach a 48-in. by 450-ft. belt conveyor before the larger carryover to form a protective cushion, and the stone is delivered to a surge feed bin of 500 tons live-storage capacity. Shortly before reaching the bin, the material passes a sensing coil of a detramp unit which controls a by-pass chute to remove any tramp iron. The conveyor has a peak capacity of 1,500 t.p.h. but normally operates at 1,000 t.p.h.

The primary crusher is equipped with a Norblo bag-type dust collector. Access from the upper to lower level is by way of an Otis passenger elevator. All equipment in the primary-crushing department is started individually from a central control panel and is electrically interlocked.

A control-panel alarm for the operator signals any equipment failure, as well as high material level in the surge chamber or bin. Red and green signal lights operate in conjunction with the alarm system to inform truck operators when to start or stop dumping into the crusher. The red "stop dump" light operates in response to high material level in the surge bins, failure of any equipment in sequence, and low pressure or high temperature of the gyratory-crusher lubricating oil. Trouble in the lube oil system also initiates a 1-min. time delay shutdown relay to allow the crusher to empty itself before stopping.

Two Jeffrey multi-power vibratory feeders, each capable of handling 500 t.p.h., feed from the surge bin to two 42-in. by 130-ft. belt conveyors which carry to the secondary-crushing building. Enroute, the weight of the material being conveyed is recorded by Merrick Weightometers, which also serve to control the rate of feed.

The initial pass in the secondary-reduction phase is over a pair of



Flowsheet of the Riverside Cement Co. plant at Oro Grande, Calif.

6- by 14-ft. Hewitt-Robins double-deck Vibrex screens. Fines pass directly to the finished-product belt, while oversize is reduced to minus ⅜ in. by two 500-t.p.h. Bulldog center-feed impactor mills. These large-capacity machines operate at 600 r.p.m., and each is driven by an 800-hp. motor. They were supplied by Hammermills, Inc. Product of the impactors is sized by four 6- by 16-ft. Hewitt-Robins screens in closed circuit; oversize returns to the hammermills.

Control of the vibratory feeders mentioned previously is accomplished through contact-making ammeters in each impactor circuit, which signal to the conveyor scales the need to increase (or decrease) the rate of feed. The scale-beam device regulates the feed by adjusting the field rheostat on the vibratory feeders. The secondary crushing department is controlled from a central panel and is entirely automatic through interlocking and a timing-cam switch. A single pushbutton for each impactor and its related equipment also shuts down at the end of a shift. Timing relays allow the system to empty itself before shutting down.

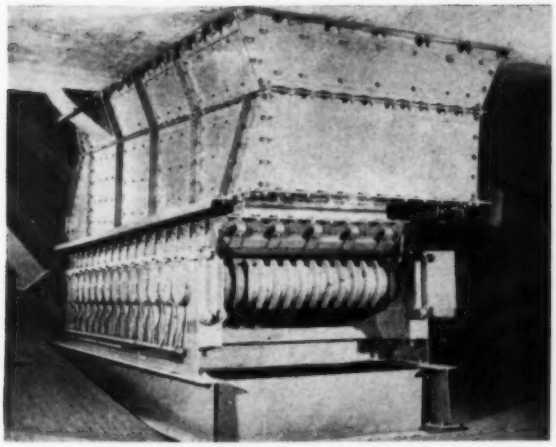
The variation in analysis of the limestone taken from different quarry faces makes continuous sampling necessary before the mill-feed product enters the storage-and-blending areas. Sampling begins with a Geary-Jennings sample cutter moving back and forth in the material arriving by conveyor from secondary crushing. Samples are fed to a Raymond air-swept Imp mill, with pneumatic electric control activated by pressure differential across the mill.

Mill sweepings in the minus 50-mesh range are air-separated and discharged through another sample-cutter chute. About 18 lb. per hr. are drawn off by the second sampler. This sample is a thoroughly-mixed blend of rock that has gone into storage for a specified length of time; and since it represents a measured tonnage of raw material, it is possible to calculate the amounts of other material needed to build a properly-blended raw mix.

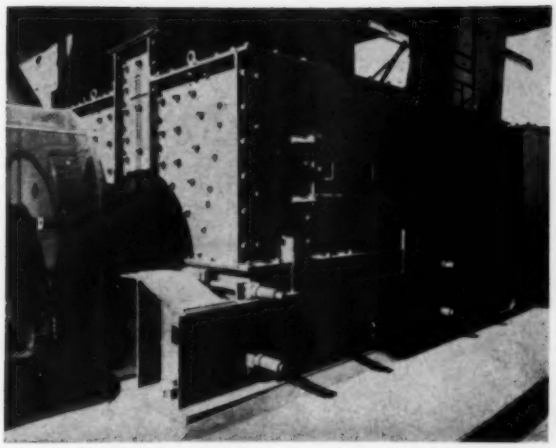
A Ramo-Wooldridge RW 300B process-control digital computer will be used to assist in making the calculation, using linear programming techniques to optimize both raw-material selection and pile composition.[1] The computer installation is

[1]See PIT AND QUARRY, January, 1959, pp. 138-139. *Digital Computer to Automate Cement Rock Crushing and Blending.*

This view shows the surge bin (right), the secondary crushing and screening station (center), and the transfer building (left). Secondary reduction is done by two center-feed reversible hammermills; scalping and sizing by six double-deck screens. Oversize (plus ⅜ in.) returns for further processing via conveyors from the transfer station.



A 12½-in. pitch, 13-bar feeder, receives primary crushed stone from a 60-in. overhead gyratory crusher.



These two 70-in. diameter secondary crushers reduce feed 7 in. and under to ⅜ in. at the rate of 500 t.p.h. The hammermills operate at 600 r.p.m., each with 800 hp.

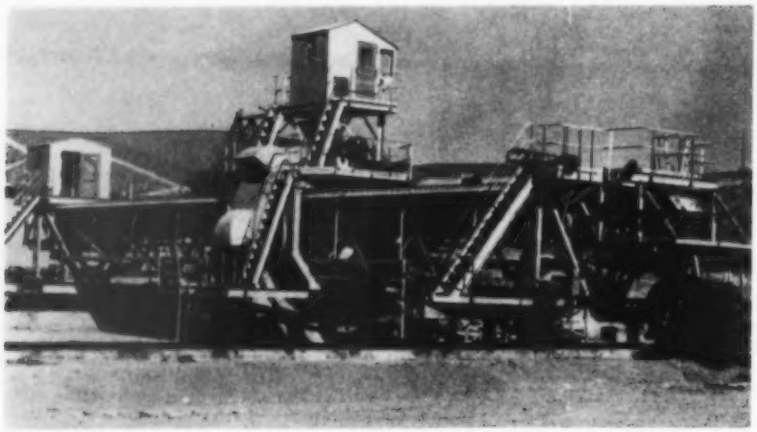
The top story of the secondary crusher building, showing two of the fully-enclosed screens. Note the maze of piping which connects numerous points where dust originates with a bag-type collector on the roof.

expected to become a reality at the plant some time in July. Meanwhile control computations are being made by long-distance teletype between Oro Grande and Thompson-Ramo-Wooldridge headquarters in Los Angeles.

The clay and shale are processed separately through the same crushing and storage system as the limestone. They are also analyzed separately by the computer and fed in the same manner, in alternate layers, to the storage.

The computer is "told" the analysis of the raw mix desired. This remains in the "memory" of the machine until the pile is complete. Analyses of the materials going into the pile and their costs (whether quarried or purchased, each has a cost factor) are stored up by the machine. Finally, the computer is "asked" how to combine to obtain the desired mix at the lowest cost. There are 7 classified raw ingredients, each having a different cost and a different analysis. The desired raw mix might conceivably be blended in different ways to attain

This traveling stacker receives raw material and delivers it over one or both boom conveyors, which step upward as the pile height increases. The piles are 517 ft. long and 36 ft. thick.



Layered material is reclaimed and blended by this 300-t.p.h. bucket-type digging wheel, which travels back and forth as it works into the pile, cutting a continuous cross section of the pile of limestone and other raw-mix components.

the proper end result, but the cost would vary. The lowest-cost mix is the one sought after. For instance, some of the excavated clay-shale has a high iron content, while at the same time hematite is also purchased at a relatively high cost.

Actually, about 30 minutes elapse from the time the sample is taken until the final computer report on the analysis is received. A pneumatic conveyor carries the gathered sample to the plant laboratory, where it is analyzed by X-ray and/or otherwise.

After the mill-size material passes the sampler stations and transfer buildings, which are served by Norblo and Western Precipitation Dualaire dust collectors, it goes to the storage and blending system. Two parallel belt conveyors are used to distribute this material into four storage piles, each 517 ft. long and 36 ft. thick and containing approximately 35,000 tons. One conveyor is distributing to two storage piles, while the other is reclaiming from one of the other two.

Distribution is done by a Hewitt-Robins traveling tripper stacker, which discharges to storage *via* one or both of its attached boom conveyors. These conveyors step upward as the pile height, or thickness, increases, and they simultaneously shorten the stacker travel to slope the ends of the piles.

The stackers thus develop a series of layers the full length of each pile. Other raw materials—clay, shale, or suitable agrillaceous components—and iron ore, may be added at any time to provide a properly proportioned raw-mix pile ready to be blended and delivered to the raw-grinding department. The system consists of four bedded piles, each containing sufficient material to supply the plant for 7 days of operation.

Stackers may be controlled on the spot or remotely. In remote operation, the operator pre-sets the stacker controls to "remote" and thereafter starts or stops it by switching its power feeder. Remote control is from the sampling building control panel. The entire sampling and stacking operation interlocks with the secondary-crushing department and must be running before the secondary crushing system can start.

Material in the piles is reclaimed and blended by an interesting new method employing a bucket equipped digging wheel (capacity 300 t.p.h.) which travels back and forth as it moves into a pile, cutting a continuous cross-section of the "sandwiched" pile, or bed. There are two of these reclaimer machines at Oro Grande, the first of their type to be built and installed by Hewitt-Robins. They are mounted on rails spaced 90 ft. apart, the 24-ft. diameter wheel, or drum, having its reclaiming buckets positioned around the perimeter to cut a nearly vertical section from the horizontal layers of raw material anywhere in a pile. The cutting arc of the bucket wheel is at the approximate angle of repose of the layered materials.

The reclaiming operation thus

A general view of the crushing-storage-blending facility at the Oro Grande plant. The surge bin feeding the secondary-crushing and screening building is in the foreground. In the distance (left) are the bedded storage area and the stacker conveyors and reclaimer machines.

FIELD REPORTS PROVE SUPERIOR PERFORMANCE OF NEW BOSTON BELTS

DIGEST OF PERFORMANCE FIGURES FOR 1296 BELTS*

44% increase in consistency of tensile strength

6% increase in tensile strength

130% improvement in consistency of elongation

* Compared to belts previously manufactured

HERE'S WHAT DOES IT!

The startling figures above are a direct result of two major belt manufacturing advancements — both developed by, and exclusive with, Boston Woven Hose & Rubber Co.

ADVANCEMENT #1 **BALANCED BELT CONSTRUCTION** for the first time equalizes ply stress so that each ply pulls its full share of the load. **BBC** eliminates lazy plies. A BOSTON exclusive because only BOSTON can combine Electronic Tension Controls with Rotocure, the continuous method of vulcanization, which assures uniformity throughout the belt.

ADVANCEMENT #2 **DULON** markedly improves the aging characteristics of BOSTON belts. An exclusive BOSTON research development, the tough specially treated cover compound stays resilient longer . . . makes the belt much more resistant to abrasion, gouging, tearing and oxidation.

BALANCED BELT CONSTRUCTION plus **DULON** add up to longer belt life . . . less trouble in service . . . greater economy.

BOSTON

BOSTON WOVEN HOSE & RUBBER COMPANY
DIV. OF AMERICAN BILTRITE RUBBER CO., INC.
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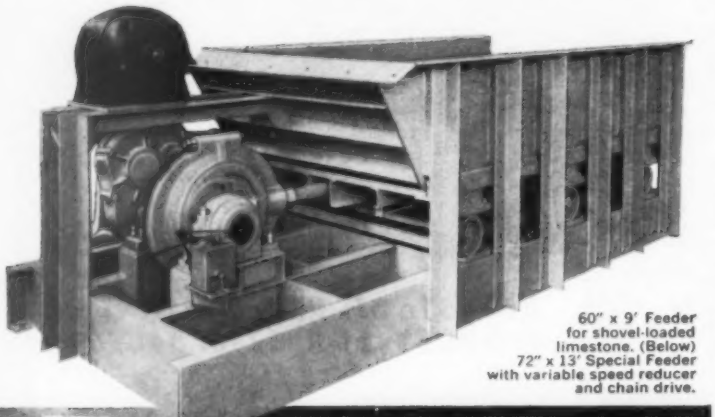
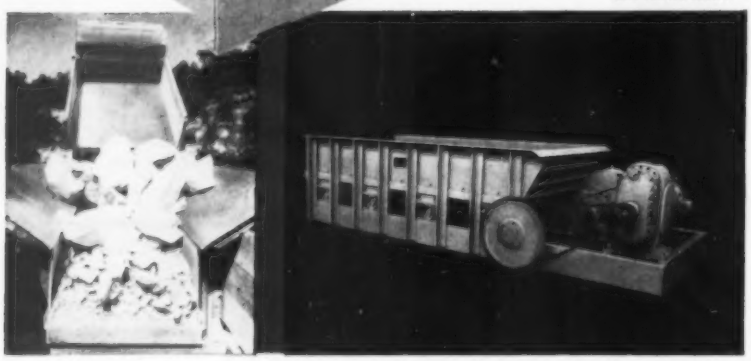
LOW COST FEEDING

from sand to shovel-loaded rock



60" x 9' Feeder for shovel-loaded limestone. (Below) 72" x 13' Special Feeder with variable speed reducer and chain drive.



Built for lower operating costs and long service, these machines feed uniformly controlled quantities of materials. *The result:* elimination of choke-ups, overloads, wear and tear on the feeder as well as on other plant machinery. *Get the facts from Bulletin FRE-57.*

McLANAHAN SINCE 1835

RECIPROCATING-PLATE FEEDERS

McLANAHAN & STONE CORPORATION

253 Wall Street • Hollidaysburg, Pennsylvania

Enter 128 on card, page 255

serves to blend and mix the material as it delivers to the Hewitt-Robins belt conveyor system, which finally carries it to the mill-feed bins in the raw-grinding department. Once started, the reclaiming belts from the storage area to raw-grind deliver continuously unless stopped, along with the reclaimer itself, by bin-level devices on the raw-grinding department bins.

Since the plant is located in a desert region where frequent dust storms occur, careful attention was given to the selection of control equipment which would be free of trouble from the dust. All pushbuttons, relays, and cam switches have sealed mercury contacts. In places for which mercury contacts were not available, such as dust-arrestor rapper contractors, a well-gasketed NEMA 12 enclosure is used to prevent dust entry.

Interlocking to direct-driven pieces of equipment is by means of mercury relays in parallel with motor-starter coils. Belt conveyor interlocking is accomplished through zero-speed switches driven by the tail pulley, or by an idler near the tail pulley.

The stackers and reclaiming machines traverse a distance of 600 ft. during their operations. Power (480-v. 3-phase) is supplied to this equipment through 600 ft. of 3-conductor cable which is paid out and retrieved by large motor-driven reels mounted on the stackers and reclaimers.

The entire system is completely lighted with 400-watt mercury-vapor Luminaires for night operation. Riverside's previous experience with the low maintenance cost of this type of lighting dictated the choice.

Wherever possible, controls have been grouped at central stations for the convenience of operation. Alarms and signals utilize both visual and audible response. To further this centralized control, a closed-circuit television installation is planned for some future date in order to provide the operator with remote observation of the critical points in the system.

Facilities for handling clinker, constructed at the Oro Grande plant at the same time, will be put into operation soon. Clinker storage and reclaiming will be the same as previously described for raw material.

Clinker will be transported by a series of Hewitt-Robins belt conveyors to a storage area adjoining the raw piles and will be sampled continuously before going into storage. A total of 9 lb. per hour will be collected to represent an average sample, so that a complete analysis of what has gone into the pile will be known at all times.

Stacking of the clinker will build a series of layers of clinker the full length of the pile. There will be a total of four piles, each approximately 600 ft. long and containing about 35,000 tons. One pile will provide sufficient clinker for approximately 10 days of finish grinding. A separate Hewitt-Robins conveyor system will return the blended clinker to the plant.

Usually one stacker and one reclaimer will be used on the raw material piles and one of each on the clinker piles. A special transfer car moves each of these units from one conveyor to the other in either the raw material or clinker storage. If necessary, it can also move units from one storage to the other.

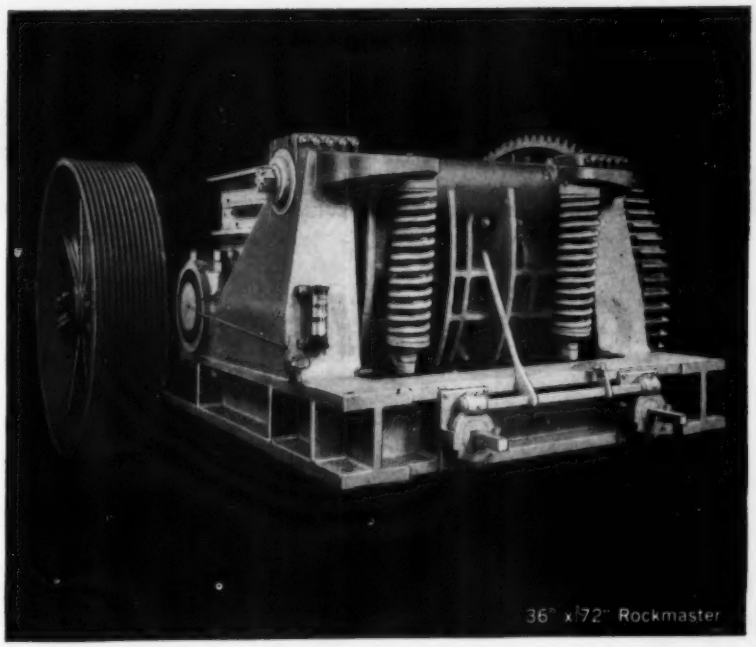
Still another phase of the improvement program at Oro Grande, currently under way, involves the installation of two 12- by 310-ft. rotary kilns. These will increase clinker capacity by 1,000,000 bbl. annually; they will replace five short, obsolete kilns which have been dismantled and sold.

Two N. Y. Trap Rock Quarries Share Cash Safety Awards

Employees of New York Trap Rock Corporation quarries at Clinton Point and West Nyack, both in New York, have earned cash incentive safety awards. Clinton Point workers were presented with a $2,000 award for achieving 700,000 consecutive man-hours without a lost-time accident, while a $1,000 check was earned by workers at West Nyack for attaining a record of no accidents for a period of 100,000 man-hours.

The Clinton Point workers shared in awards totaling $10,000, including the present award. This is the first time the West Nyack plant has received a cash incentive award from the Company. During 1957 it placed tenth in national competition.

world's MOST POWERFUL single-roll crushers



Widely used for primary and secondary crushing on the hardest and toughest kinds of shovel-loaded rock and ore, Rockmasters have high capacities and extraordinary ratios of reduction. Also they are the world's finest crushers for wet and sticky feed. Among outstanding design features: Automatic Steelstrut Toggle for release of tramp iron, and Quick-Adjustment for controlling size range.

Get all the facts from Bulletin RMTD-56.

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ROCKMASTERS

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Enter 129 on card, page 255

General's Miami Plant Built

By WALTER E. TRAUFFER

ANOTHER ON THE SPOT REPORT

THE General Portland Cement Company in 1958 completed a modern plant near Miami, Fla., to serve the southeastern part of the state. It supplements the existing plant at Hooker's Point, near Tampa, 230 miles to the northwest. The new plant is located on State Highway No. 27, 3½ miles south of U.S. 41 (The Tamiami Trail) and 18 miles west of downtown Miami, just on the edge of the Everglades. The plant is connected by a 7-mile siding to the Seaboard Air Line Railway. Both rail and truck shipments are made. It is a 2-kiln wet process operation designed for a capacity of 2,500,000 bbl. annually. The usual types of cements are being made at this plant.

In 1955 the present site was thoroughly investigated, and in 1956 it was announced that a plant would be built. Construction of access roads was begun in December, 1956. The quarry was in operation July 14, 1958, the raw grinding department on July 26, the kiln on August 2, the clinker mills on August 15, and the first cement was shipped August 26, 1958.

The wet process was selected for several reasons, including the wet raw material and the unlimited supply of water available. The closed-circuit wet-grinding system was supplemented with a system of flotation which will be used only when needed. Another feature is the floating crushing plant, from which the raw rock is pumped to a shore dewatering plant.

Of special interest is the fact that the kiln department is completely inclosed. This was done because of the heavy seasonal rains, which could cause enough shell shrinkage to damage the kiln lining. There is also always the possibility of power failure, due to hurricanes, etc. As in many recent new finish grinding installations, the clinker is fed to the separator in circuit. The 12 cement storage silos have individual pressure-release dust collectors.

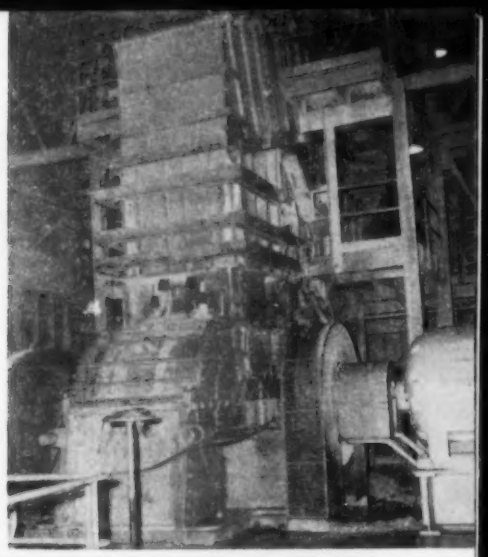
In the plant construction, concrete was used throughout in a wide range of applications which show its versatility. Prestressed and precast units are used wherever possible, as well as concrete block and tile.

Raw Materials Raw materials include the local stone and clay, bauxite, kaolin, etc. The limestone rock deposit is basically the Miami oolite formation found throughout this area. It is quite porous, with sand pockets; it averages 4 to 8 percent total silica down to the 45-ft. level being worked.

Rock Recovery and Processing Drilling of blast holes under water is at present being done with a rotary air-cleaning drill to a depth of 45 ft. The material is

Opposite page: Aerial view of General's new Miami plant near the Everglades, showing the cement silos and the packhouse (left), the finish mill building (center foreground), the raw department (center background), and the flotation department (right background).

attractive exterior only one of many highlights in modern wet-process plant



The 72- by 60-in. non-clog hammermill primary crusher on the barge. Above it are the plate feeder and the scalping screen.

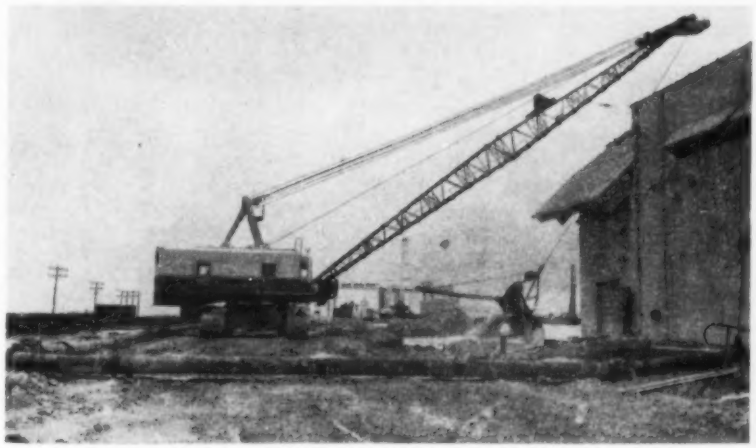
Entirely of Concrete

excavated by a Marion 191M electric crawler dragline with a 120-ft. boom and an 8-cu. yd. dragline bucket. The latter feeds the rock into a hopper on a steel barge which is 48 ft. wide and 92 ft. 6 in. long, with a draft of 8 ft. A 5- by 12-ft. reciprocating plate feeder discharges over a 5- by 12-ft. 2-deck heavy-duty screen.

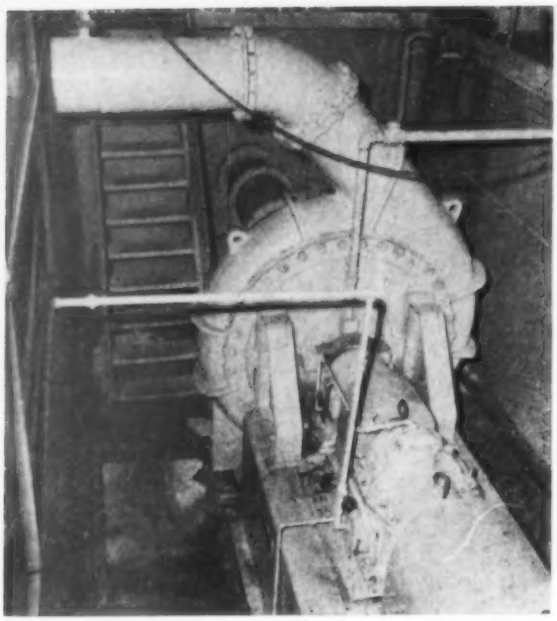
All material over both decks — plus ¾-in.—goes to the 72- by 60-in. non-clog hammermill, which is driven through a coupling by a 1000-hp. 600-r.p.m. motor. Its product and the minus ¾-in. material from the screen flow into a sump. A 16- by 10-in. pump sprays in the necessary water for pumping the material with about 15 percent solids content.

The 16-in. extra-heavy-duty dredge pump is driven through an extra-heavy-duty coupling by a 1000-hp. 600-r.p.m. wound rotor induction motor. It picks up the material from the sump and pumps it through a 16-in. line of special wear-resisting pipe, varying from 1,700 to 4,800 ft. long, to the plant. There it discharges into the breaker box of the dewatering plant, which has abrasion-resistant liners on its sides and a bar grizzly in the bottom. Rock over the grizzly is discharged through a chute direct to storage, and material through the grizzly is split to a pair of 6- by 14-ft. 2-deck screens.

Material off both decks goes to storage *via* chutes. Minus ¾-in. fines go to a pair of 32-ft. long double scalping tanks. These in turn feed to a pair of double-screw classifiers and dewaterers. The fine product from these also goes direct to storage. Waste water is discharged through a 4-ft. pipe into a waste pond, taking with it dust collected from the kiln stack gases.



The 8-cu. yd. dragline which digs rock from under water and discharges it to the barge (right), on which are a crusher, a screen and the pump to plant.



The 16-in. heavy-duty dredge pump on the barge, which feeds material from the sump to the dewatering installation at the plant.

Raw Materials Storage The raw materials storage building is 74 ft. wide and 175 ft. long and is used for the storage of rock, clay, iron, bauxite, etc. It is served by a 17-ton overhead traveling crane handling a 4-cu. yd. clamshell bucket, which distributes these materials into walled compartments and also reclaims them. There is storage capacity for 3,000 cu. yd. of limestone, 1,500 cu. yd. of clay, 600 cu. yd. of iron and 450 cu. yd. of bauxite or kaolin.

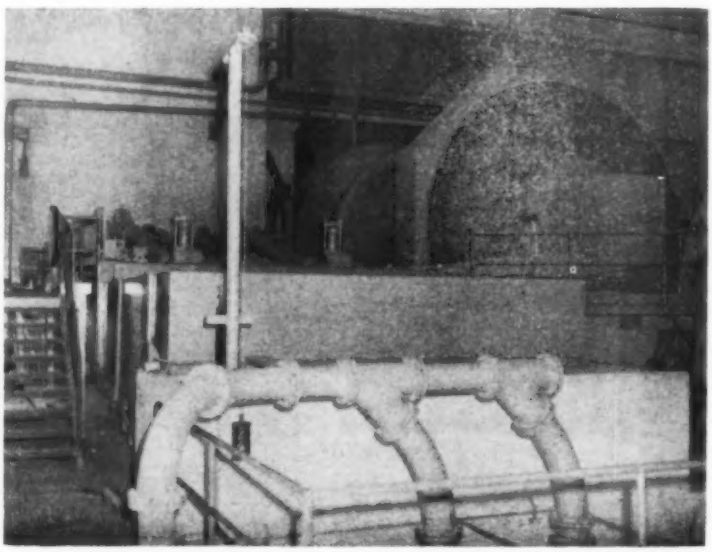
The clay used is shipped by rail 270 miles from the pit near Brooksville, which also supplies the company's Tampa plant. The overhead crane unloads this material direct from the cars to storage. Iron ore, bauxite, and kaolin are similarly received and stored.

Preliminary Raw Grinding Rock is fed from storage by the crane to a raw mill feed hopper, from which a 42-in. by 10-ft. pan feeder discharges it into the 13- by 16-ft. ball mill. Iron ore and bauxite are also added at this mill through screw feeders. This mill is loaded with 15 tons of 3-in., 79 tons of 2-in., and 15 tons of 1½-in. forged steel grinding balls. It is driven at the rate of 15.6 r.p.m. through a coupling by a 1,500-hp., 180-r.p.m. synchronous motor. An electric ear controls the rate of feed to the mill. Water is added in the mill, and the rock slip is discharged to a 16- by 36-ft. rake classifier. A 42-in. diameter, single-screw classifier conveys the rejects back to the scoop feeder of the mill, forming a closed circuit. Finished rock slip overflowing the screw has a fineness of 62 percent through 200 mesh and a moisture content of 40 to 45 percent.

Fines from the screw sump can be pumped either to a flotation department when the silica content is excessive, or direct to the blending tanks.

Final Grinding In the present direct flow, the rock slip is pumped from the screw sump direct to two of the nine slurry tanks. It is fed from these tanks by two 450-g.p.m. pumps to a ferris wheel feeder to the 9½- by 36-ft. 2-compartment regrind mill, which is also fed clay from another tank. This mill is driven at 19.8 r.p.m. through a heavy-duty coupling by a 1,500-hp. 180-r.p.m. synchronous motor. Feeders are controlled by means of an electric ear. This mill is loaded with 50 tons of 1-in. and 50 tons of ⅞-in. grinding balls and grinds to a fineness of 88 percent through 200 mesh. Two 5-in. pumps feed the mill product to five of the storage tanks for blending.

Clay Processing The overhead crane re-handles clay from storage to the 29-ft. 6-in. diameter clay wash mill. There 60 percent water is added, and the clay slip is pumped by two 1,000-r.p.m. pumps to two of the nine slurry blending tanks. Enough of this clay to make the proper blend is then fed to the regrind mill.



The preliminary raw grinding ball mill with the rake classifier in closed circuit (left). Rejects are returned by the screw classifier. The slurry pumps are in the foreground.

Flotation For flotation, the rock slip from the preliminary grinding mill is pumped from the screw classifier sump direct to a 135-ft. diameter thickener, which has a capacity of 179,480 cu. ft. The agitator arm is driven by a 5-hp. motor. Underflow from the thickener is pumped to a 30-ft. diameter hydroseparator, which further reduces the water content, and thence to the flotation cell house.

In this building are the distributors, the necessary reagent tanks, feeders, mixers, etc., and the flotation machines. There are now two rows of four 56-in., 3-cell flotation machines. These are adequate for ordinary needs, but a third row of cells can be added if this should be necessary.

Underflow from the first row of flotation machines goes by gravity to the second row, and underflow from these, in turn, goes through a flume to the 225-ft. diameter Dorr concentrates thickener, which has a capacity of 483,507 cu. ft. The agitator arms is driven by two 3-hp. motors. This unit will further reduce the moisture content to the desired percentage. Raw rock slip underflow is then pumped to the same three slurry tanks which now get the product of the preliminary raw mill direct, and the same flow is followed from there on, through the regrind-mill, etc.

Overflow from all of the flotation machines will be reject containing most of the silica, which will go to a tank, to be pumped into the worked-out section of the quarry pond.

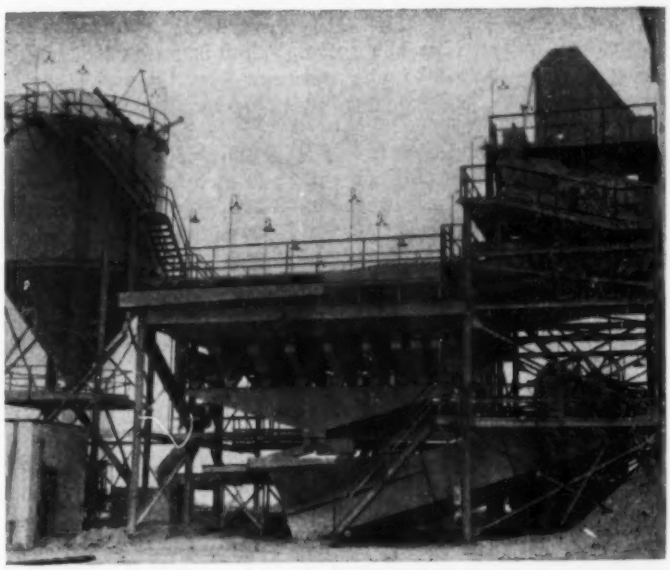
A standby 150-kv.-a. diesel generator set ensures power for the entire flotation department in an emergency. Stoppage under load in this equipment would create serious problems.

Slurry Blending Each of nine slurry storage and blending tanks is 30 ft. in diameter by 60 ft. high, with a capacity of 4,300 bbl. Each is equipped for mechanical and air agitation. As described, three of the tanks are used to store the stone-iron-bauxite slip direct from the preliminary raw mills, or from the flotation department, when that is in use.

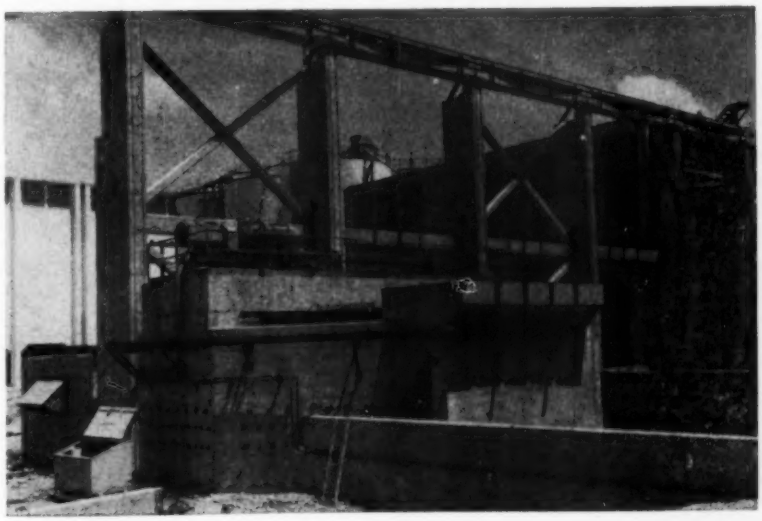
Two tanks are used to store clay slip from the wash mill. The other four receive the finished slurry from the regrind mill and are used for blending. The necessary transferring from tank to tank is done by two 6-in. Morris pumps. On a control board under the tanks are nine liquid level recorders and alarm horns for high and low level. The 135-ft. thickener can also be used for slurry storage if desired.

The finally-blended slurry is transferred to the tanks by two of these 5-in. Morris pumps to the two 36-ft. dia. by 40-ft. deep kiln feed tanks. Each of these is equipped with a mechanical and air agitator and has a liquid level recording controller, also on the above panel. The slurry averages 40 percent moisture content.

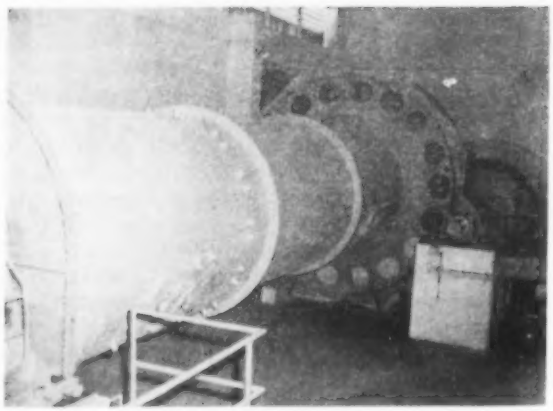
Kilns Ferriswheel feeders driven direct from the kilns through girth gears and chains provide a constant slurry feed ratio. The two 11-ft. 3-in. by 425-ft. kilns are mounted on six sets of rollers and slope ½ in. to the foot. Each is



The rock dewatering system with screens, scalping tanks, and screw classifiers. At the left is the tank from which flue dust is fed into the waste water flume.



Clay is mixed with water and agitated in this wash mill before going to the slurry blending tanks.



The 2-compartment regrind mill which is fed rock and clay slip from the blending tanks. The product is slurry, which goes to the final blending tanks.

driven through a 32.5 to 1 herringbone reducer and a flexible coupling by a 150-hp. 900/720/450/360-r.p.m. a.c. motor. The kiln speed range is from 15 to 60 r.p.h.; and the kilns are now being operated at 60 r.p.h.

Each kiln is lined with 9-in. brick, back to the chain section; and 60 percent alumina is used, except in the burning zone, where 70 percent is used. Insulating brick is used for only 36 ft. under the girth gear. Both kilns have chain systems in their feed ends. In both chain sections 5-in. wear-resisting brick is used.

Gas Disposal Kiln exhaust gases, averaging 500 deg. F., are drawn through dust chambers to the two Western Precipitation Cottrell electrical precipitators. Each of the latter consists of three parallel units divided into four cross-sectional compartments having 9- by 20-ft. curtains, rapping systems, and the latest vacuum tube rectifying systems. The two kiln draft fans are rated at 155,000 c.f.m. at 4 in. S.P. at 450 deg. F. One is driven clockwise, and the other counterclockwise, both by 200-hp., 900-r.p.m. motors. Dampers ahead of each fan temper the gases, which are discharged to atmosphere through one 250-ft. reinforced concrete, brick-lined stack, 16 ft. 6 in. in diameter, inside the lining.

Precipitator dust is collected by a system of 12-in. screw conveyors. This, with the flue dust, is fed by a pneumatic conveying system to a steel tank at the raw rock dewatering station. From this tank the dust is fed into the waste water flume for disposal in the quarry pond.

Fuel The kilns are equipped to be fired with either Bunker C (No. 6) oil or coal, whichever is the more economical at any time. At present, oil stored in two 10,000-bbl. tanks is being used. High-pressure burners and primary air fans are used; and the oil is preheated to 210 deg. F. by a hot air heater.

Coal will be reclaimed from the silos by vibrating feeders direct to two direct-firing bowl mills. These have double-cone air classification and are connected to mechanical collectors rated at 24,000 c.f.m. Coal will be ground to 76 percent through 200 mesh. Water-cooled burner pipes are used.

Kiln Control Operation of the kilns is controlled from centralized control boards. Each of the latter has all instruments necessary for modern kiln operation, including a Bailey oxygen and combustibles recorder and analyzer, front and back end temperature indicators, draft gauges, ammeters, slurry overflow lights, controls for every motor related to the kiln operation, and instruments for the oil-burning system and the coal mill.

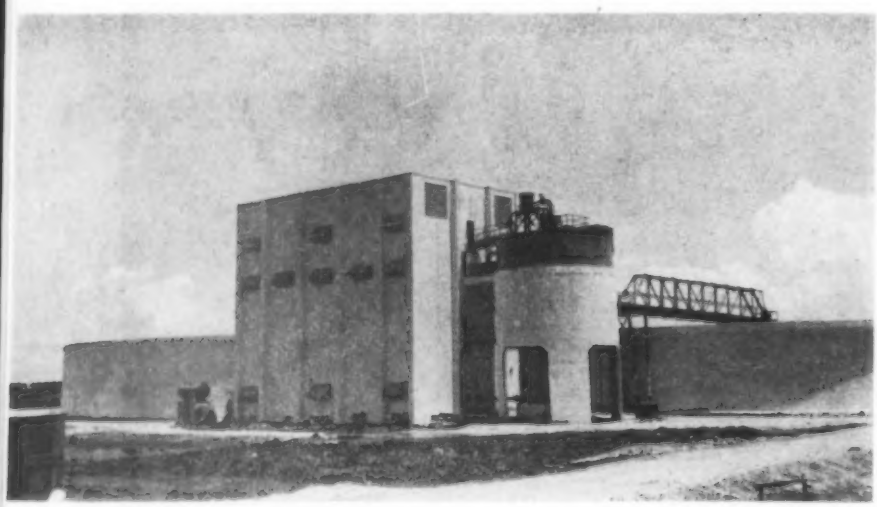
On separate boards alongside are the instruments and controls for the coolers and the oil- and coal-firing systems. An important factor in the control setup is the 12-station interplant telephone system, which connects with the office, the laboratory, and all important plant departments.

Clinker Cooling Clinker is discharged from the kilns to a pair of 7- by 50-ft. 3-compartment inclined-grate clinker coolers, each of which is equipped with a clinker breaker at its discharge end. Each cooler also is connected to a mechanical dust collector and a fan.

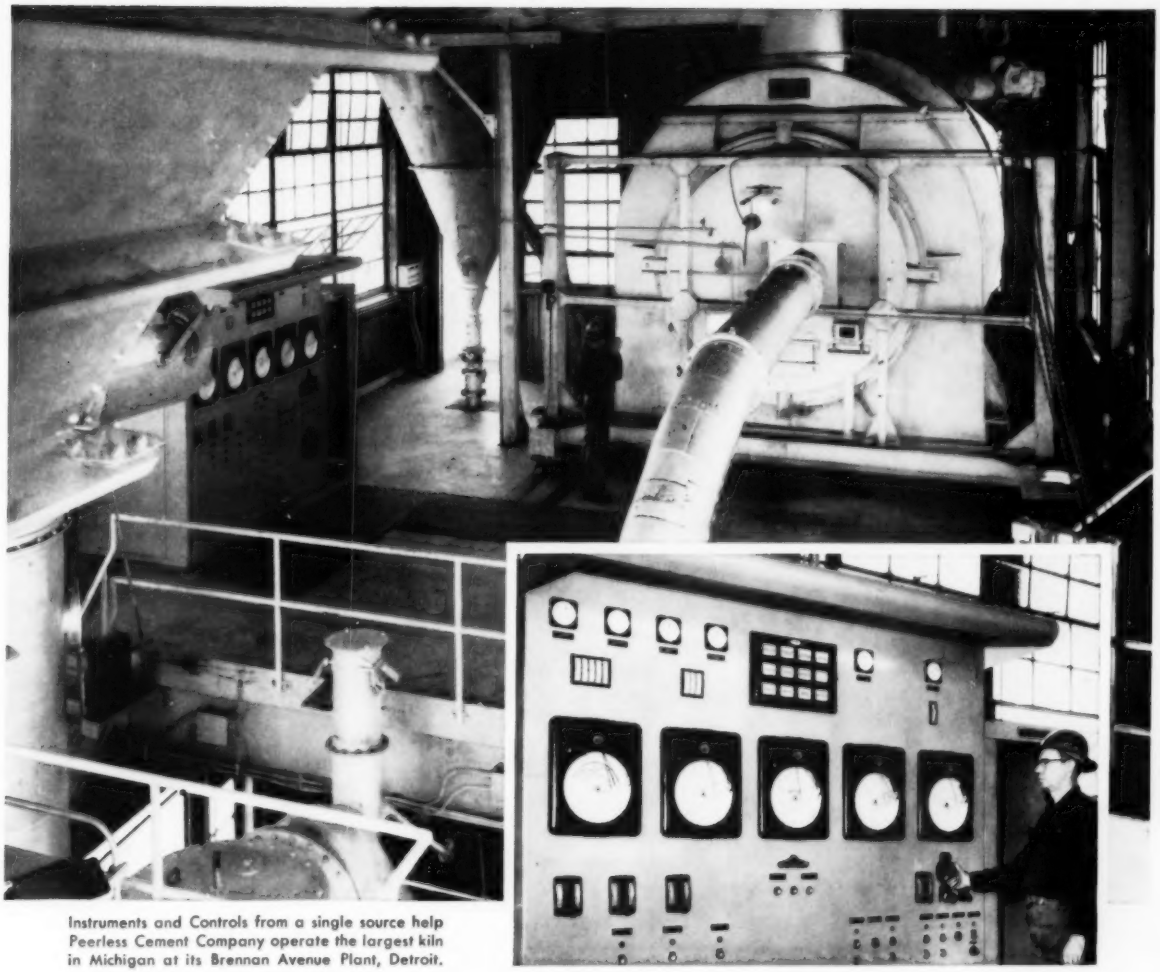
Clinker, Gypsum Storage From the coolers, the clinker is discharged to a series of dragline conveyors, bucket elevators, and dragchains to four of the six 30-ft. diameter, 6,000-bbl. silos used for clinker and gypsum storage. The two star bins are also used for clinker storage.

Gypsum, rock used for masonry cement manufacture, and coal can be unloaded from cars at a station

(*Continued on page 139*)



The flotation department, with the two thickeners and the hydroseparator. This department will be used only when needed.



Instruments and Controls from a single source help Peerless Cement Company operate the largest kiln in Michigan at its Brennan Avenue Plant, Detroit.

This giant kiln gives peak performance <u>longer</u> with Bailey Controls

The Peerless Cement Company of Detroit demands maximum capacity, uniform production and low fuel rate from its largest kiln . . . and Peerless gets it!

They do it with a Bailey Control System that gives them complete control of combustion, clinker cooler, and other kiln variables.

The system keeps continuous chart records of 11 important variables, including temperatures, drafts, air flow, kiln speed, fan speed, % oxygen, and % combustibles.

All this is done so dependably that the kiln often makes week-long runs without being touched.

All recording receivers in the Bailey System are plug-in components—easily removed, regrouped, or replaced to meet changing requirements. Additional records are added simply by plugging in receivers on existing recorder cases. Your Bailey Engineer can help you plan for peak performance — call him or write for your Bailey Kiln Control Folder.

C115-1

BAILEY METER COMPANY

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BAILEY METERS

TSP Pinions on cooler kilns.

TSP Bevel Gear and Pinion on burner kiln main shaft.

TSP

hardened products in service since 1917 at NORTH AMERICAN CEMENT

TSP Pinions drive this pre-grid mill.

TSP Gearing and Trunnion wheels on all kilns.

TSP Trunnion on burner kiln. Note "mirror surface" even after 13 months' service.

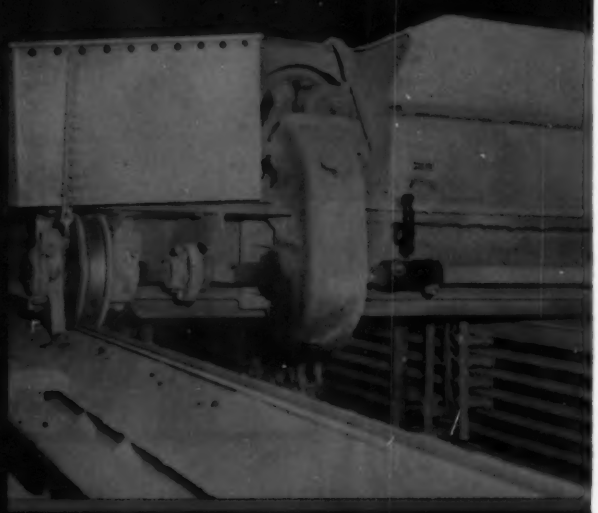
TSP Pinions drive these mills.

TSP Gudgeons on screw conveyors.

TSP Mill Drive Gears.

TSP Mill Bull Gear.

TSP Wheels on overhead cranes.



TSP Rope Drums on overhead cranes.

TSP hardened products, a few of which are shown here, are in wide use in all North American Cement Plants . . . and for very good reasons. Each year they save thousands of dollars in replacement costs alone. In addition, equipment runs better and longer, drastically reducing expensive 'downtime' costs.

"Tool Steel Process" products have superb quality and outstanding wear characteristics, a result of a special hardening process. A file-hard surface to the full depth of permissible wear gives maximum life. The core, refined for toughness and ductility, gives maximum strength. They are also guaranteed in writing to outperform any competitive product in the same service. That's why North American Cement and practically every other leading cement plant in the country have been big users of TSP hardened products for many years.

TSP products are made to order, or to fit existing equipment. Modern gear cutting machines produce gears in sizes up to 197" outside diameter. Other products up to 20,000 lbs. weight. Write today for fully illustrated brochure—"TSP Products for the Cement Industry."

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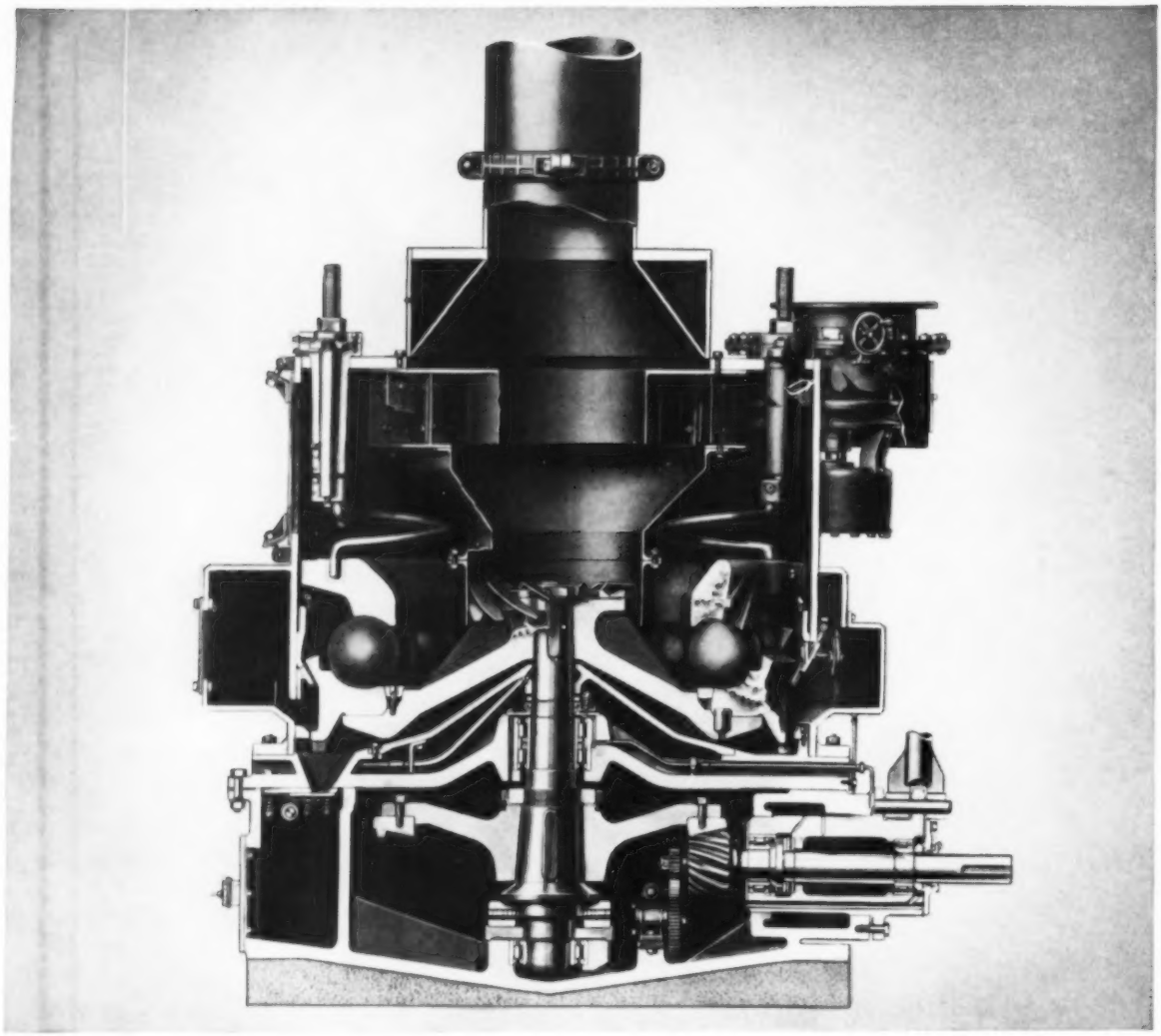


Low pulverizer maintenance assures long continuous operation in direct kiln firing

B&W Pulverizers for the direct firing of rotary kilns are engineered and built to give long, uninterrupted service with minimum maintenance. The pulverizer is compact, self-contained, and fully enclosed. Grinding elements are made of long-life, special wear-resistant metals, and there are no bearings or parts in the grinding zone to be lubricated. The helical reduction drive with anti-friction bearings is isolated completely from the dust and high temperatures of the grinding zone. Lubrication is automatic. The result—less wear and tear on vital operating parts—and less maintenance.

No dismantling of pulverizer or piping is necessary during scheduled shut-downs to replace grinding elements. Large, quick-opening access doors in the pulverizer housing permit speedy inspection and removal of parts.

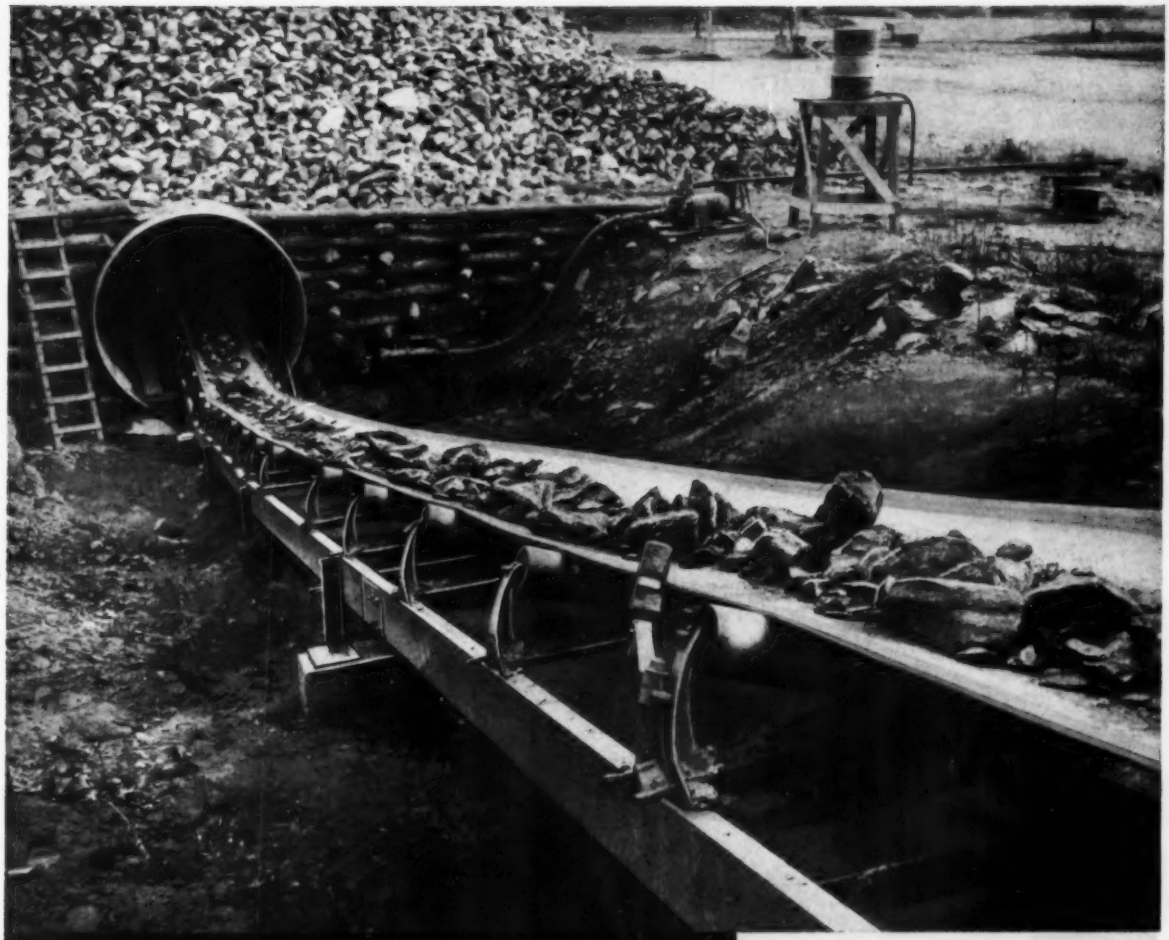
These B&W design and maintenance features, backed by years of satisfactory performance, assure continuous, trouble-free service in modern kiln operation. Write for additional information to the Babcock & Wilcox Company, Boiler Division, Barberton, Ohio.

C-219

B&W

THE BABCOCK & WILCOX COMPANY

BOILER DIVISION



Don't look at the load on the belt . . . look at its edge

Notice the shiny band the edge of the belt has polished on the vertical training idler? Acme-Hamilton forestalls this critical wear condition by building extra-durable square edges on all its belts . . . . a good point to file for future reference if edge wear is plaguing you.

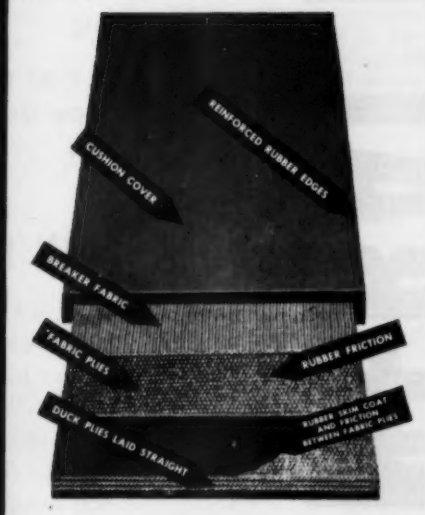
Reinforced Edges and covers defy abrasion, cutting, sharp impacts.

Breaker Fabric. Optional double cord fabric acts as second cushion, increases cover adhesion.

Fabric Plies. Impregnated with rubber to add strength.

Rubber Skim Coat. Provides a resilient bed between plies.

Write Acme-Hamilton, Dept. Q3.



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GENERAL REFRACTORIES

FOR EXTREME BURNING ZONE CONDITIONS

The unique construction of GREFCO'S STEELKLAD-EE, with steel plates embedded in the brick, gives this refractory superior resistance to extremely severe burning zone conditions. All STEELKLAD liners offer these important advantages:

STEELKLAD-EE

STEELKLAD

1. Lower thermal conductivity than burned brick.

2. Greatly increased resistance to thermal and mechanical spalling.

3. Cold face notch for positive taper identification.

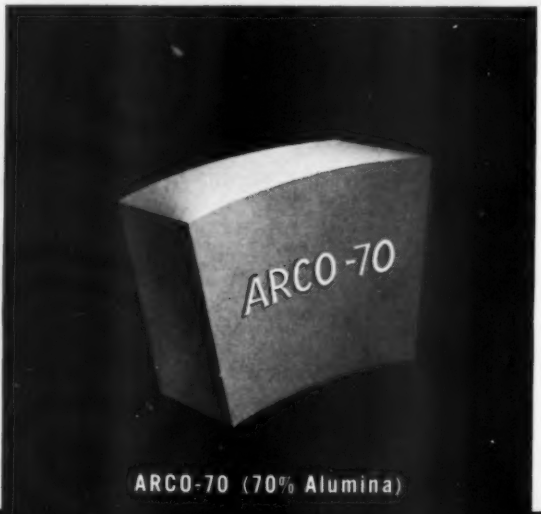
4. Steel plates in radial joints.

5. Superior composition enables brick to take on and hold protective coating essential to long life.

6. Built-in expansion allowance (cardboard expansion strips attached).

FOR NORMAL BURNING ZONE

Grefco's ARCO-70 high alumina kiln liners for lining entire burning zone or for use in conjunction with STEELKLAD kiln liners in severe burning zone service. Available in all standard sizes and shapes.



ARCO-70 (70% Alumina)

GREFCO ROTARY KILN LINERS

FOR OTHER KILN ZONES

Where less service stresses exist, the following quality Grefco products will meet individual requirements.

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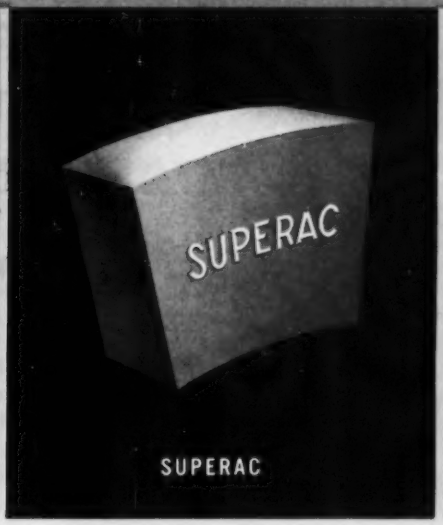


SUPERAC

SPECIAL HR

HIAC A super duty brick for Calcining and Intermediate Zones. Gives greater thermal spall resistance and higher volume stability than that offered by a high duty brick.

SUPERAC A high fired super duty, spall resistant brick of high density and low porosity. For service in Discharge Nose Rings, Dams and Cooling Zones.

SPECIAL HR A dense, strong and hard burned refractory brick made especially for service in Kiln Chain Sections, Rotary Coolers and Stone Dryers, where abrasion is a problem.

HIGH DUTY GREFCO offers numerous high duty brands, available from all producing districts with specific properties for use in cold and intermediate zones, kiln hoods, and coolers.

Grefco Technical and Sales Service Personnel will be glad to discuss with you the refractories best suited to your particular needs.

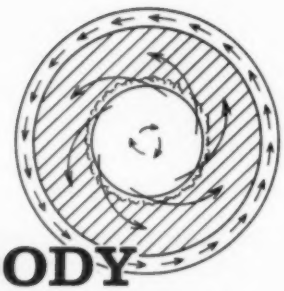
GENERAL REFRACTORIES COMPANY

PHILADELPHIA 2, PA.

A COMPLETE REFRACTORIES SERVICE

Enter 136 on card, page 255

CEMENT VALVES used in routing dry processed cement in closed conveyor systems wear rapidly in the seating areas. A typical plant rebuilt cut-outs with hard bronze and re-machined for approximately $250.00 each. Valves usually lasted another 60 to 90 days. Centrifugally cast seats of Stoody 1 inserted in the valve body cost less than $200.00 per set, last several years! These Stoody 1 valve seats are carried in stock in various sizes.

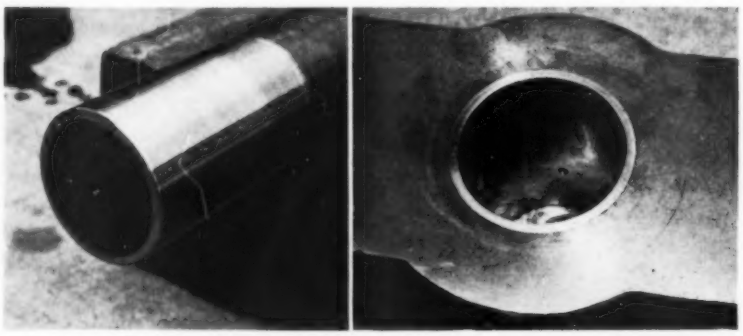


STOODY CENTRIFUGAL CASTINGS

for cement plant wear problems!

For over 35 years Stoody Company has actively fought wear in industrial equipment with specialized hard-facing alloys. In recent years much development work has been devoted to *centrifugally casting* many of these same alloys as long-wearing replacement parts. For suitable applications, results are phenomenal. The centrifugal process produces an extremely dense, fine grained casting free from porosity and defects found in ordinary castings. Finish machining insures tolerances impossible to achieve with weld deposits. *Although more costly than conventional parts, economy of centrifugal castings far exceeds that of standard parts, with down-time reduced to a minimum!*

CONVEYOR WHEELS of hardened steel measuring 4" diameter, wore to destruction in six weeks. Centrifugally cast from WB5, a Stoody alloy, similar wheels have been in use for 7 years.



JOURNALS & BEARINGS — No appreciable wear was found after 15 months service in this Stoody 6 journal and bearing from the bottom spool of a bucket elevator. As photographed, they had already outlasted 4 roller bearing installations.

A very complete, descriptive catalog featuring Stoody CENTRIFUGAL CASTINGS is available, showing typical uses in cement and other industries. Write for your copy or ask your Stoody Dealer (check the "Yellow Pages" of your phone book).

STOODY COMPANY

11940 East Slauson Avenue • Whittier, California

General Portland

(*From p.* 134)

near the finish-grinding department. A 5-ton car shaker facilitates unloading. A jaw crusher can be used for reduction, and conveyors feed gypsum into the two silos adjacent to the clinker silos.

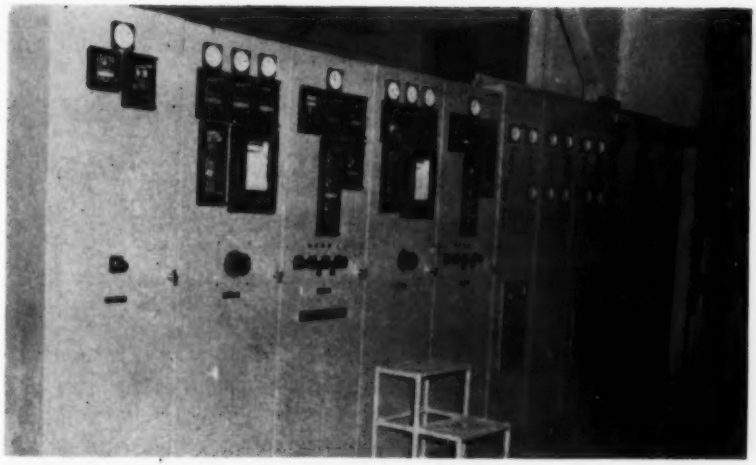
Two similar silos across the track in the kiln building will be used for coal storage, but they can also be used for clinker storage. There are dust collectors over the clinker and gypsum silos.

Clinker Grinding Feeding and blending of the clinker and gypsum is done by 30- by 48-in. electric vibrating feeders under each of the six silos and 18- by 48-in. feeders under the interstices. These feeders have start-stop pushbuttons and separately mounted 440-v. rheostat control. The gates above the feeders are adjustable. Blended finish mill feed is carried on two 120-ft. natural-frequency conveyors, rated at 75 t.p.h. each, to bucket elevators feeding the two 16-ft. separators. Airslides carry the coarse from the separators to the two 13- by 16-ft. ball mills.

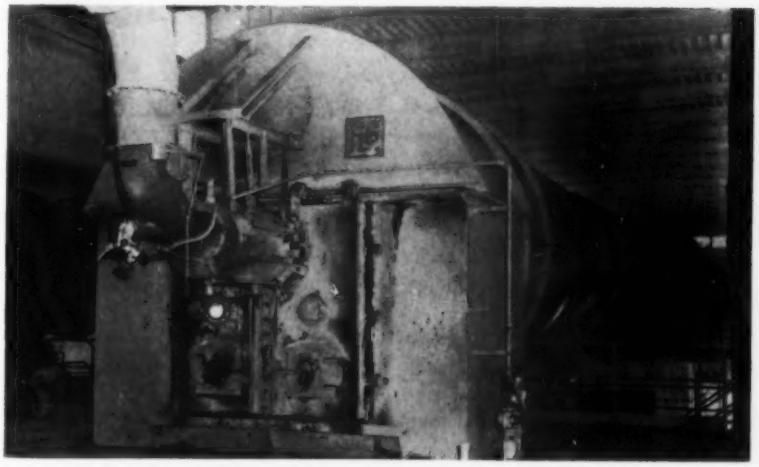
These mills are driven at 15.6 r.p.m. through flexible couplings by 1,500-hp. 180-r.p.m. synchronous motors, and speed is automatically controlled through Hardinge electric ears. Each mill has a load of 30 tons of 3-in., 140 tons of 2-in., and 30 tons of 1½-in. grinding balls. The product of the mills is fed by 16-in. Airslides to the bucket elevators feeding the separators, which are vented to 6-compartment bag-type dust collectors.

Finished cement from the separators and the dust collectors is discharged—from No. 1 *via* a 12-in. Airslide—to the two 9-in. Type H Fuller-Kinyon pumps, which feed to storage through an 8-in. line. Type I cement produced is ground to 1,750 sq. cm. per gm. Wagner at the rate of 215 bbl. per hr. per mill.

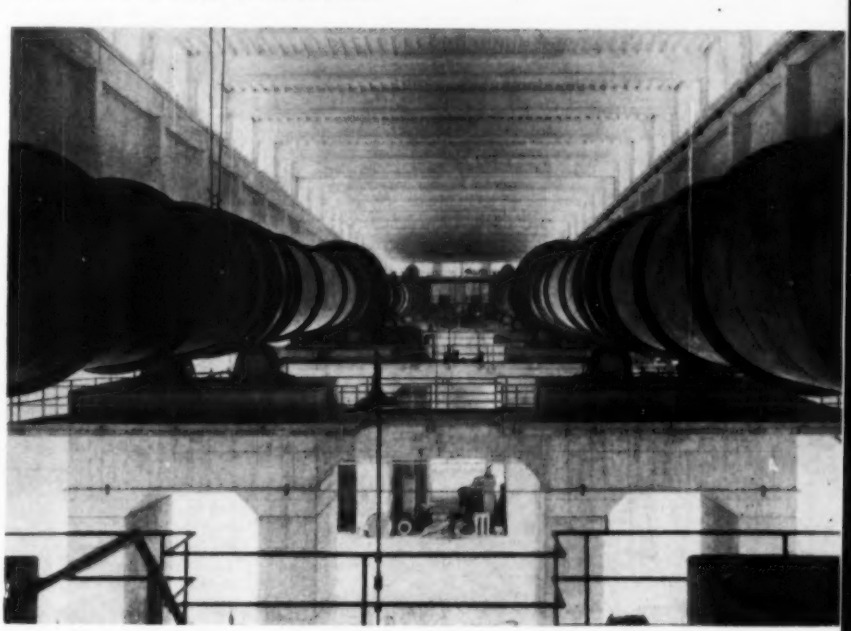
One of the two grinding circuits is fully insulated so that masonry cement can be produced. In this



The board from which the entire raw department is controlled.



The feed end of one of the two 11-ft. 3-in. by 425-ft. kilns. These kilns are now fired with oil, but they are also equipped to burn coal.



This view of the two kilns also illustrates the wide use and attractiveness of concrete construction.

The control board for one of the two kilns has a full complement of instruments including an oxygen analyzer, recorders, indicators, controllers, etc. At the left are the boards for the oil- and coal-burning systems.

case, one of the clinker silos is used for limestone. An oil-fired generator provides direct heat for drying in the separator.

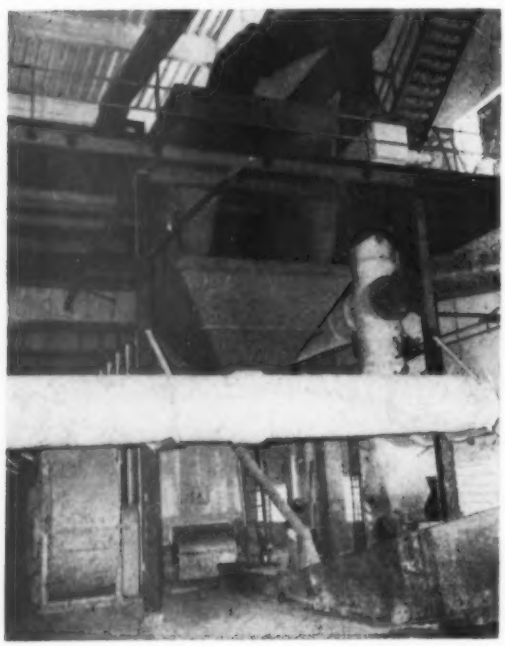
Cement Storage and Packing The cement storage system consists of 12 concrete silos, which are in two groups of six with the packhouse between them. Each silo is 32 ft. in diameter by 128 ft. high, and total storage capacity is 240,000 bbl. Air release is through bag collectors over each silo. All cement silos have upper and lower level indicators, and the conical silo hoppers have air pads to insure even flow. Airslides feed the cement to rubber bulk-loading spouts, control being through air-controlled solenoid valves. Airslides also feed to elevators to the bins over the four 4-tube valve bag packers. Bindicators insure constant feed. Four sectional conveyors are used for loading cars.

Other Airslides reclaim cement under the hopper conveyors, and there is a bag collector over each packer bin. Shipments are weighed on two 200-ton railroad track scales with 72-ft. platforms.

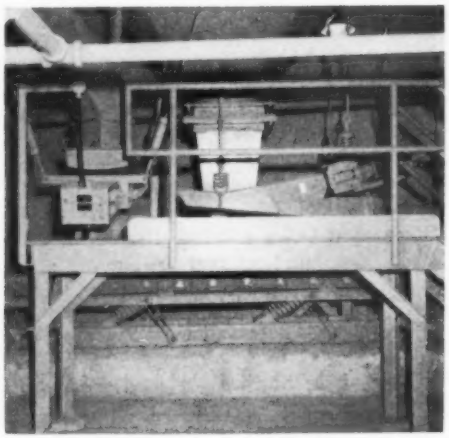
Chemical Control The mechanical and instrumental control system in this plant is unusually complete. Just as nearly complete is the chemical control of the material throughout the entire operation. For example, samples are taken of the rock in storage, the raw mill product, the rock slip after flotation, at several points in the slurry blending system, after the regrind mill, under the finished slurry and kiln feed tanks, the clinker, and the finished cement. These tests all through the raw end assure the desired mix, especially as to lime and water content. Clay and other materials used are tested as received. A motor scooter is used to pick up samples.

The laboratory is in the attractive main office building and has the required chemical and physical testing equipment. The entire building is air-conditioned, and the laboratory also has humidity control.

Power Electricity is purchased from the Florida Power and Light Company, which reduces it at a substation from 69,000 v. to 4,160 v. In the company's switchgear building there is an incoming line breaker and five 1,200-amp. circuit breakers for distribution to one or more transformers at five different stations—the quarry, raw mill, finish mill, kilns, packhouse, and shops. The 4,160-v. current is used only for the dragline, dredge pump, primary

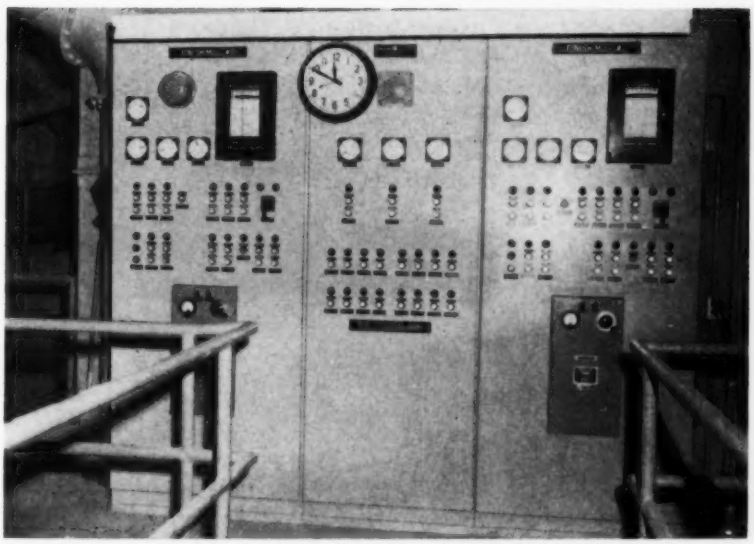


Left: One of the two inclined grate clinker coolers with its fan, cyclone collector, and hammermill. The drag chain conveyor to storage is in the foreground.



Right: Vibrating feeders under one of the clinker bins and the interstice, discharging to the oscillating conveyor below.

Control boards for the two finish grinding mills, their separators, and other related equipment.



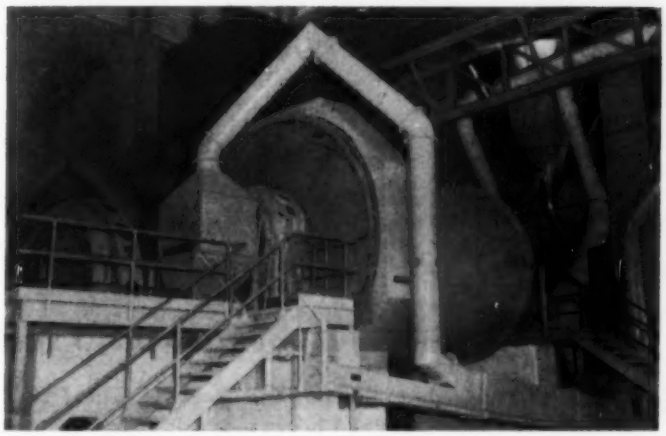
crusher, and grinding mills. At these five departments current is reduced to 440 v. for all other motors.

All 4,160-v. wiring is in underground conduit, and direct-burial cable is used. Due to the high water table, much of this cable is under water; and therefore a cushion of sand is used in the trench. The lower-voltage wiring is also of the direct-burial type, and much of it is buried.

The quarry feeder cable is buried to the edge of the quarry and from this point it is carried overhead on poles. Portable armored cable is used to the dragline and the barge. As a safety measure, the ground system is completely isolated from the power company grounds. Around each building there is an exposed wire grid in the ground to spread the grounding system over a larger area.

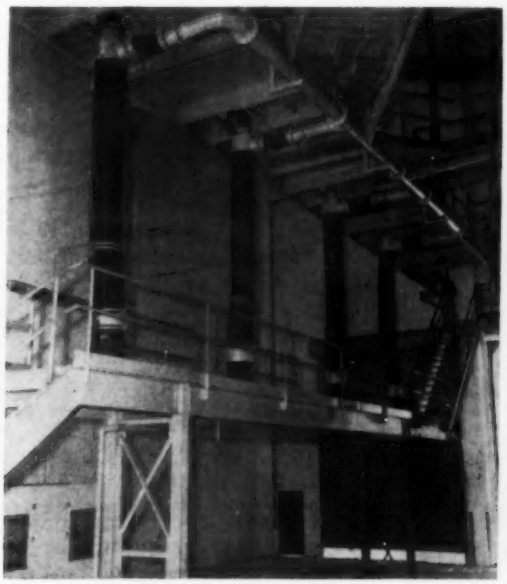
Each building has a lighting transformer, and electricity is used for heating water, plant offices, washrooms, etc.

Water and Sewage An ample supply of water is provided by deep-well pumps. This water is used for both process and drinking, and the latter is treated and softened. Process water for the

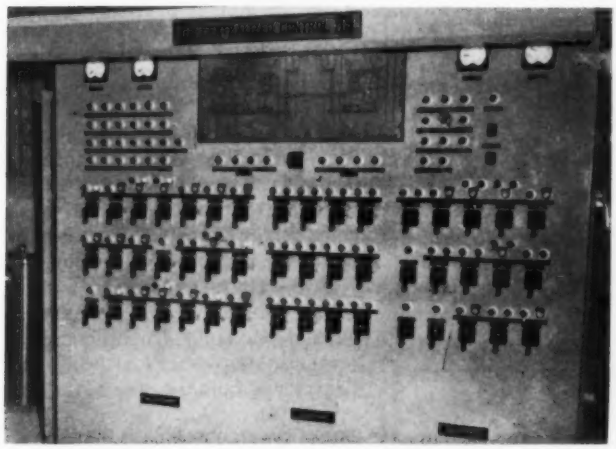


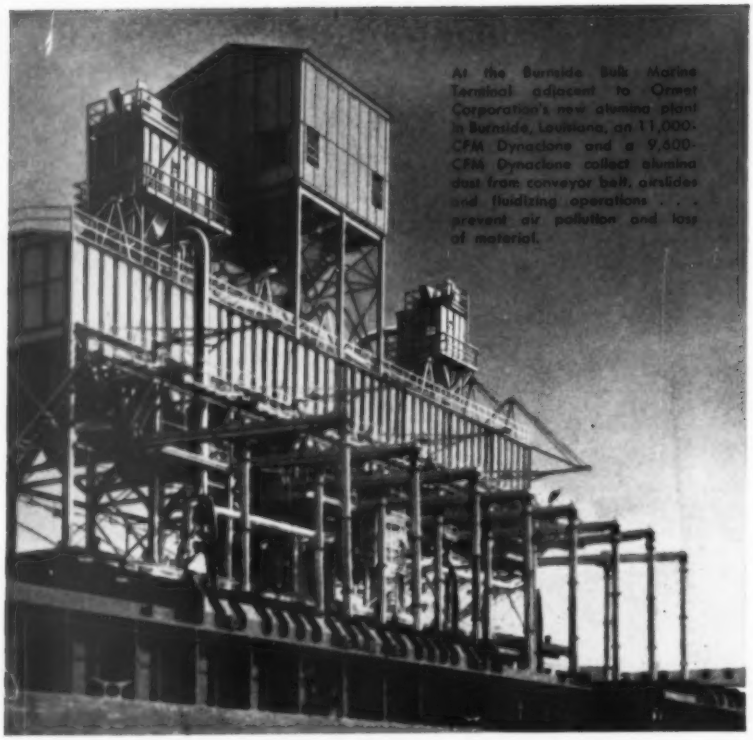
One of the two 13- by 16-ft. finish grinding ball mills with its mechanical separator and dust collector (background).

Right: Some of the flexible spouts used for bulk loading of railroad cars.



Below: The control board for the cement storage silos, the bag packhouse, and bulk loading.

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raw grinding and flotation departments is stored in two 30-ft. diameter outdoor tanks and in the four interstices between the slurry blending tanks. The sewage disposal plant uses the Imhoff tank and filter treatment systems.

Design and Construction The kilns, mills, and other heavy equipment are mounted on short piling. The rock surface is 4½ ft. above sea level, but heavy rains during the time of construction kept the ground water 2 ft. above normal. As a result, pumping at the rate of 45,000 g.p.m. was necessary.

All silos and tanks and all the major buildings were built with slip forms. The 700-ft. long kiln building was poured in four sections—three 200- and one 100-ft. Construction included prestressed roof girders and precast double-T roof slab, precast columns and louvres in all buildings, and precast tilt-up wall panels in the office and service buildings. Concrete blocks were used for partitions, with Shadowall in the interior of the office building.

Safety Every possible safety precaution is taken throughout this operation. Beginning at the quarry, all drives and moving equipment are protected by guards; and railings are used where necessary. Personal protective equipment is provided, including hard hats, safety shoes, goggles, and respirators, although there is little need for the last item. There is a well-equipped first-aid room, and first-aid supplies are also kept at several other points. Before a man is employed, he must pass a complete physical examination.

Miscellaneous A 40-ton overhead traveling crane serves the entire raw-grinding department. This unit also handles a 39-in. diameter direct-lifting magnet used for loading grinding balls into the mills. There is another 40-ton crane in the kiln building. A 30-ton crane serves the clinker-grinding department, including ball loading.

Two rotary compressors supply air for agitation of the slurry blending and feed tanks. Rotary compressors also supply air for the Fuller-Kinyon pumping systems and for other uses.

Automatic lubrication is used on

the drive gears of the two raw mills and the two clinker-grinding mills. These are all time-clock-controlled for four points on the mill drive gear. Plug valves are used in the slurry lines. In the flotation department, 12 rubber pinch valves (7- and 8-in.) are used on the slurry lines. The plant buildings are kept clean by vacuum cleaning systems.

N. Y. Trap Rock Subsidiary Orders Push-Type Towboat

The first modern push-type diesel towboat specifically designed for the Hudson River was recently ordered by the Cornell Steamboat Company, a subsidiary of New York Trap Rock Corporation, West Nyack, N. Y. The twin-screw vessel, which is to be built by Dravo Corporation, Pittsburgh, Pa., will incorporate hull and rudder design features developed by Dravo and refined by model basin tests in the Netherlands Ship Model Basin at Wageningen, Holland.

Powered by two Fairbanks-Morse engines with a combined 1800 shaft horsepower, the vessel will be capable of pushing 20 of Trap Rock's loaded crushed stone barges at approximately 4½ m.p.h., pool water speed.

A principal difference between the design for the new boat and that of typical harbor duty tugs is the manner of mounting the propellers. The twin 7-ft. stainless steel propellers of the push-type boat are mounted in welded steel nozzles, which in effect are hydrofoil sections surrounding the propellers, increasing the boat's pushpower approximately 25 percent at operating speeds.

Management Award for 1958 Received by Ideal Cement Co.

Ideal Portland Cement Company was recently awarded a certificate of excellent management by the Audit Committee of the American Institute of Management, New York. This award, for 1958, is the third consecutive one received by the firm.

The management audit is a study of all phases of business operation, including production efficiency, sales vigor, fiscal policies, economic function, corporate structure, and research and development.

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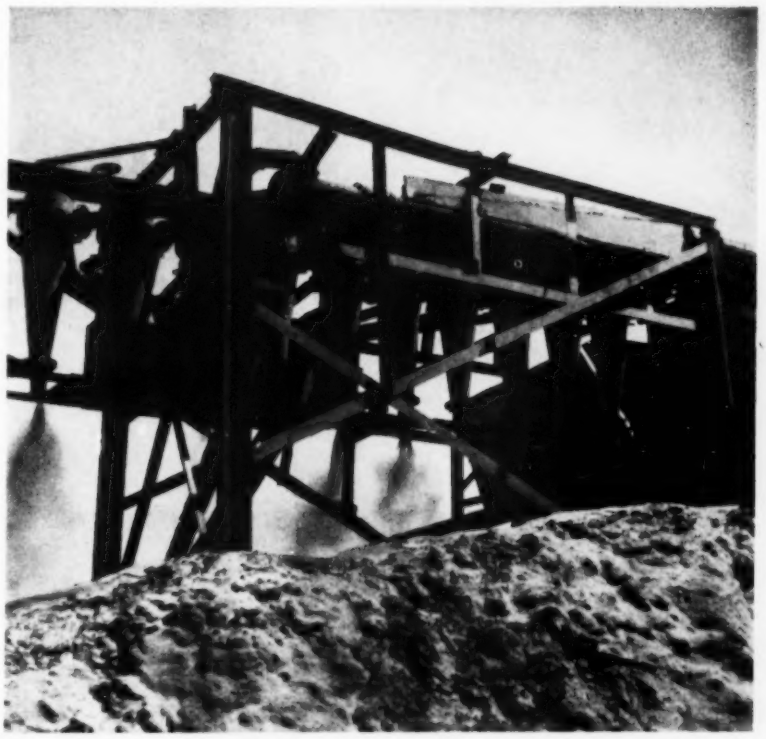

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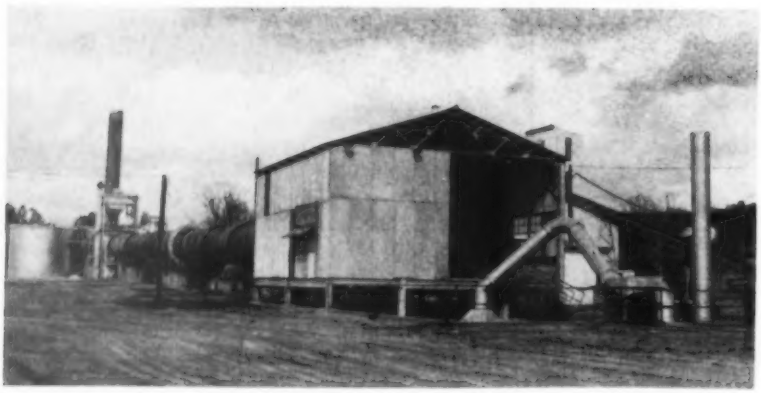


The 10- by 400-ft. rotary kiln at Mississippi Valley Portland's Redwood plant. The slurry feed tanks and stacks are in the background; in right foreground is the rotary cooler.

The conveyor at the left feeds crushed rock to the stockpile over a tunnel, from which it goes to the reduction crusher and then to the mill building in the background.

ANOTHER ON THE SPOT REPORT

THE Mississippi Valley Portland Cement Company has in full operation its new 680,000-bbl., $5,000,000 wet-process cement plant at Redwood, on State Highway No. 3, 14 miles north of Vicksburg Miss. Built primarily to supply local needs, this plant was also financed largely by local capital. It was designed for high output per man-hour, and the work force averages 70 to 75 people for all shifts. Features include an unusually complex deposit of limestone and marl, the use of stockpiles and a tunnel reclaiming system for all dry raw materials, and the cement storage silos over the packhouse. The plant was built without a railroad siding, and shipments for the time being are entirely by truck. Its location on the navigable Yazoo River makes water shipment a future possibility.

The company is a Mississippi corporation chartered in February, 1956, as a promotion by local people. All funds were raised through the sale of stock, mostly in Mississippi and some also in Louisiana, Arkansas and Tennessee. There are 6,500 stockholders, many of them contractors and cement users. This venture was encouraged, but not in any way promoted or subsidized, by the state government, which has an

The single-slugger roll crusher which has mud rolls to provide a steady feed to the conveyor below.

New Plant Requirements

active program under way for the encouragement of new industry and development of the state's resources.

In August, 1957, contracts were signed with Kennedy-Van Saun and the M. T. Reed Construction Company, Jackson, Miss. Kennedy-Van Saun designed the major part of the plant and supplied most of the equipment. The Reed firm did the structural engineering and construction and all of the machinery erection. The crushing and washing department started up on October 20, 1958; the kiln was in operation January 2, 1959; and the first cement was shipped on February 12. The formal opening ceremonies were held on May 5.

Designed for a capacity of 2,000 bbl. daily, the plant is already exceeding that figure for short periods, although final tuning up has not yet been completed. The cement produced is meeting all specifications, including those of the state, and the Federal Government. At present only Type I and Ia cements are being made, but masonry and Type II cements can also be made. In the plant design provision was made for future expansion.

Deposit The deposit is a sedimentary one of relatively young geological age. The limestone is known as the Glendon limestone in the Vicksburg formation, which occurs in a strip running southeasterly across the entire state. It consists of alternate layers of limestone from 2 to 5 ft. thick, and marl from 4 to 7 ft. thick. There are 12 ft. of limestone in four layers and 18 ft. of marl in three intermediate layers in the 30-ft. face. Each band is fairly constant in thickness and in analysis. The 2½-ft. bottom ledge of rock is left temporarily for the quarry floor and taken out later as the operation moves on.

The marl has considerable lime content, averaging between 50 and 60 percent $CaCO_3$, and the mix is held at 76 percent. No iron ore or sand additions are necessary, and all the stone and marl can be used, along with the importation of some high-calcium limestone which is available from several sources. The alkali content of the raw materials is so low that the finished cement contains only 0.25 percent.

Quarrying Overburden is temporarily being moved to low-lying areas adjacent to the plant, but it will later be put back into the worked-out quarry. This overburden consists of 20 to 30 ft. of loess,

Trucks dumping rock and marl to the apron feeder over the primary crusher.

Left to right: Scott Kipping, plant superintendent; Henry V. Allen Jr., executive vice-president; and Robert E. Knarr, technical director and chief chemist.

a fine silty loam common to the Mississippi Valley.

In drilling, the wet marl is a problem as it interferes with blowing out the holes. A Joy No. 125CW drill with a Pioneer drag-type bit is used to drill 4½-in. holes. Holes are drilled only to the top of the bottom limestone layer in a 7- by 9-ft. pattern. Hercol No. 2 (40 percent) dynamite is used. Loading is done so that the explosive is only at the limestone layers, with decking in between at the marl layers. A marked stick is used to gauge depths.

The explosive is distributed 1½ lb. in the top ledge of limestone and 13 lb. in the second and third ledges. Caps are placed in the bottom of the hole, with Primacord to the surface. Shots usually consist of three rows of 7 holes each, using 0 to 3 delays staggered. Detonation is by electric caps off a blasting machine. About 5 tons of material is brought down to 1 lb. of explosive.

Secondary breakage is done with a crane and a 4,500-lb. dropball. This equipment is also used to break up the 2½-ft. bottom layer of limestone which forms the quarry floor. This is the softest of the several layers and has the highest calcium content.

Loading is done by a 2½-cu. yd. Bucyrus-Erie shovel into two 22-ton Le Tourneau-Westinghouse diesel-powered rear-dump trucks. This equipment is also used for stripping.

Crushing-Screening The trucks are now hauling about 1,000 ft. to the primary crusher hopper in the quarry. A 48-in. by 20-ft. Kennedy apron feeder provides a steady feed of stone into the 30- by 72-in. Pennsylvania single-slugger roll crusher, which is rated at 275 t.p.h. The 9-in. minus product of this crusher drops into a hopper. A set of 36-in. by 6-ft. Kennedy-Van Saun mud rolls under this hopper provides a steady feed onto a 30-in. by 273-ft. belt conveyor. The latter discharges to the 11- by 26-ft. Kennedy counterflow rotary scrubber, which has propelling and retarding flights for greatest turbulence and separation; 1,200 g.p.m. of water is provided. The scrubber has two trommel screens at the discharge end. Attrition of limestone in the scrubber increases the calcium content of the marl discharge by 10 percent.

This discharge, which flows through ½-in. openings in the front end of the scrubber, passes over a 5- by 12-ft. Kennedy 1-deck screen. The minus 4-mesh material — 65 percent water—is pumped through an 8-in. line to the marl storage tanks. Oversize material is returned to the scrubber and back into the circuit. Rock discharge from the scrubber is chuted to the No. 14 Kennedy gyratory crusher, which is rated at 150 t.p.h. Crushed rock is carried on a 24-in. by 428-ft. belt conveyor across the highway on a covered bridge, which also carries the marl and water pipelines to the raw stockpile. The quarry and crushing department in three days of one-shift operation provide enough raw material for a week of plant operation.

The 11- by 26-ft. rotary scrubber, from which rock goes by conveyor and marl by pipe (right) across the road to the plant.

Storage The rock stock pile is above a reclaiming tunnel. Imported limestone, clinker, and gypsum are also stored above the tunnel, the gypsum in a concrete silo. Gypsum is received by truck and unloaded by conveyor to the storage silo. Materials are reclaimed through 19 gates in the concrete tunnel onto the 24-in. by 275-ft. reclaiming belt conveyor. One material is handled at a time. By means of a splitter box at the inclined end of this conveyor the materials can go either to a hammermill for further crushing or directly onto a belt conveyor to the mill building.

From the splitter box the limestone passes to a bucket elevator discharging onto a 5- by 12-ft. Kennedy 2-deck screen with 1-in. openings on one deck. Oversize goes to a Kennedy 42- by 48-in. ham-

mermill. Screen throughs and the crusher product, both minus 1-in., are discharged onto the 24-in. by 280-ft. mill belt conveyor. All other materials go direct from storage to this conveyor. A traveling tripper over the mill feed bins discharges into the six steel mill feed bins—two of 200-ton capacity each for clinker and limestone, and others for gypsum and for stone to make masonry cement.

Raw Grinding There are three 3,000-bbl. capacity 38-ft. diameter by 30 ft. high marl slurry storage tanks, each equipped with Dorr mechanical and air agitators. The slurry has 35 percent solids content and usually forms about 40 percent of the raw mix. The marl is pumped from one tank at a time to a constant-level mill feed tank.

Merrick Feedoweights proportion crushed limestones from three feed bins onto a belt conveyor feeding the 9- by 28-ft. Kennedy-Van Saun 2-compartment raw mill. The ferriswheel feeder supplies marl slurry from the constant-level tank. The blended rock feed rate is kept constant, and the marl feed rate is adjusted whenever necessary to hold the desired analysis. This, of course, also requires a compensating adjustment of the water feed rate to the mill. The latter is driven at 19.3 r.p.m. by a 1,100 hp., 4160-v. Westinghouse motor.

The mill is loaded with 196,000 lb. of 3-, 2-, and 1¼-in. U.S. Steel high-carbon, forged steel grinding balls. The mill has an oil film bearing. A hydraulic lift pumps oil to raise the mill off the bearing before it is started.

Raw material is ground to a fineness of 82 percent minus 200-mesh, and the slurry water content averages 45 percent. Two 4-in. Wilfley pumps (one in reserve) feed the slurry into one of five 38-ft. diameter by 30-ft. high slurry blending tanks of 3,000-bbl. capacity. Blending, based on oxide analysis of the clinkered raw material, can be done by pumping from any one or more of the tanks into any other. The tanks are filled 25 ft. deep. This allows 5 additional feet for corrections. After a tank is corrected, its contents are pumped to two similar tanks which are used for kiln feed. All 10 tanks are equipped with Dorr mechanical and air agitators, and ten Wilfley pumps serve the blending and feeding operation.

Burning Slurry is fed to the kiln by a ferriswheel feeder which is synchronized with the kiln drive. All overflow slurry goes back to the tank. The 10- by 400-ft. Kennedy-Van Saun kiln is mounted on six tires and has a slope of ⅜ in. per foot. It is driven at from 68 to 69 r.p.h.—the speed range is 50 to 72 r.p.h.—by a 150-hp. d.c. motor through a speed reducer. The shell has stiffeners everywhere (except in the burning zone) and an air-cooled seal ring at the firing end. An emergency kiln drive is provided.

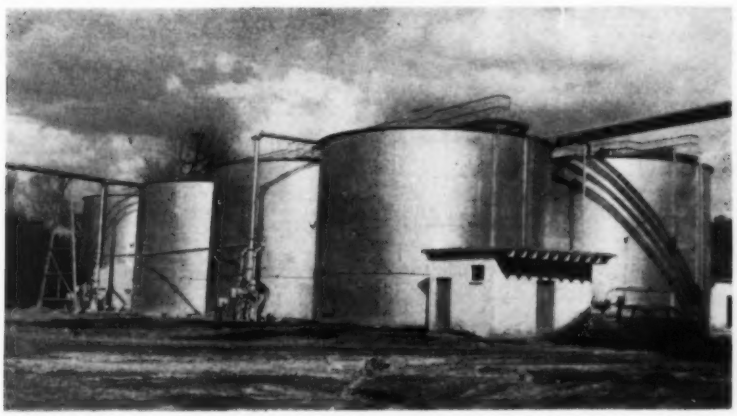
The kiln is lined with Mexico refractories—standard brick everywhere except for 70 ft. of 70 percent alumina in the burning zone and 70 ft. of wear-resisting brick in the chain section. About 5,000 ft. of ¾-in. link chain is used, but there is space for more.

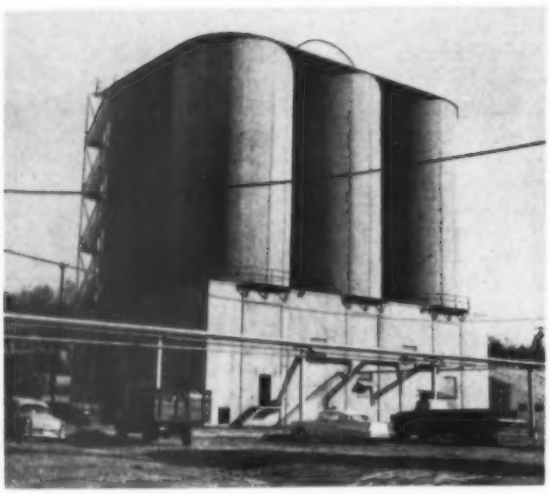
Cooling Clinker is discharged from the kiln through a brick transfer chamber with a stainless steel plate bottom into the 10- by 8- by 60-ft. Kennedy air-quenching rotary clinker cooler, which bells out at the feed end and has Herculite liners with a quenching air blast between them from a No. 57 Kennedy fan. A No. 60-16 center-vent air fan takes out air from the discharge end of the cooler. The clinker is discharged, at a temperature of about 100 deg. F., to a 16-in. by 93-ft. inclined drag chain conveyor, thence to a 24-in. by 141-ft. inclined belt conveyor which feeds to a 24-in. by 54-ft. reversible distributing belt discharging to a 30,000-bbl. pile over the reclaiming tunnel.

Fuel, Etc. The kiln is fired with natural gas through a Kennedy No. 14 burner which can also be used for oil. Primary air at ambient temperature and 46 lb. pressure is supplied by a Spencer turbocompressor. Secondary air at 1,200

Right: The scalping screen and the secondary crushing hammermill used for further reduction of the rock.

Below: The marl and slurry storage and blending tanks, which hold 3,000 bbl. each. At the left are some of the ten slurry pumps used in this operation.





The six 10,000-bbl. concrete stave cement storage silos, which are supported on the reinforced-concrete packhouse.

to 1,400 deg. F. is supplied from the cooler. The kiln is producing at its designed rate of 2,000 bbl. per day, with a fuel consumption of 1,500,000 cu. ft. (1,035 B.t.u./ft.^{3}) per bbl. The temperature in the burning zone is 2,700 deg. F., and the exit gas temperature is 450 to 500 deg. F.

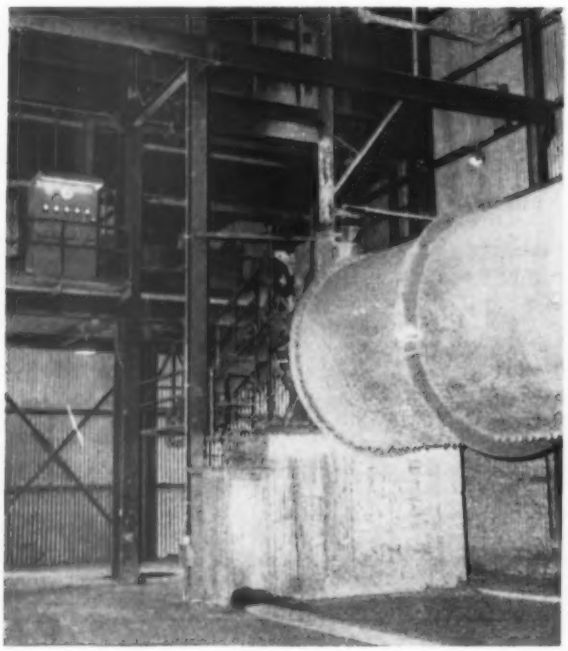
Kiln exit gases go through a dust chamber to a Buell cyclone type dust collector rated at 90,000 c.f.m. at 450 deg. F. A 100,000 c.f.m Buffalo fan vents the air to atmosphere through a 100-ft. concrete stack of 8-ft. interior diameter. All collected dust is returned to a hopper over the kiln feed end by a screw conveyor and bucket elevator. A screw conveyor feeds the dust into the kiln at the desired rate.

Controls The kiln is operated at constant speed with constant gas flow. Minor adjustments are made in the primary air. A Beckman oxygen analyzer is a part of the system. Burning zone temperature is recorded by an optical pyrometer, and an alarm system warns if the exit gas temperature exceeds 700 deg. F. In addition to the above, the Kennedy kiln control board and cubicle have a Republic gas flow meter, a Minneapolis-Honeywell temperature recorder and speed indicator, Hays draft gauges, and a Bailey draft controller.

Clinker Grinding The clinker, gypsum, and stone feed bins are also equipped with Merrick Feedoweights, which discharge the desired blend onto a short belt conveyor feeding the 11- by 18-ft., 2-compartment Kennedy finish grinding mill. The load is 172,800 lb. of 3-, 2-, 1¼- and 1-in. forged steel balls, and the mill is driven at 16.9 r.p.m. by an 1,100-hp. Westinghouse motor. This mill also has an oil lift arrangement for use in starting.

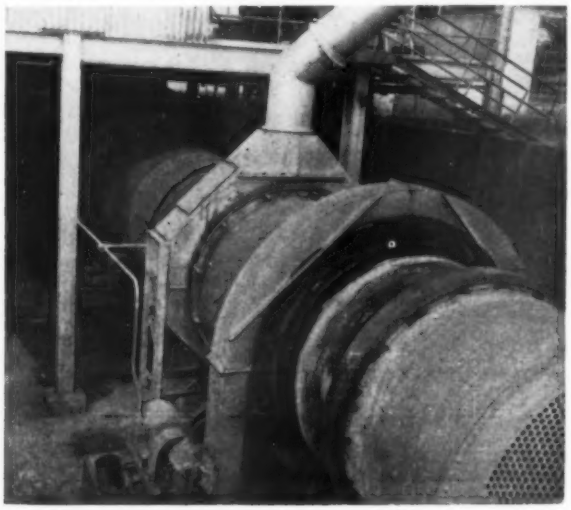
Mill product is discharged to a bucket elevator, and a Kennedy 18-in. by 45-ft. air conveyor feeds it to a 16-ft. Sturtevant mechanical separator. Oversize is returned to the mill feed. Dust goes to a 6-ft. dia. cyclone and back to the elevator. The air goes to a Norblo dust collector, which is oversize for cement cooling, and is vented to atmosphere. Finished cement from the separator and dust collector—98 percent through 200-mesh—goes *via* a Kennedy automatic pneumatic transport pumping system to storage silos.

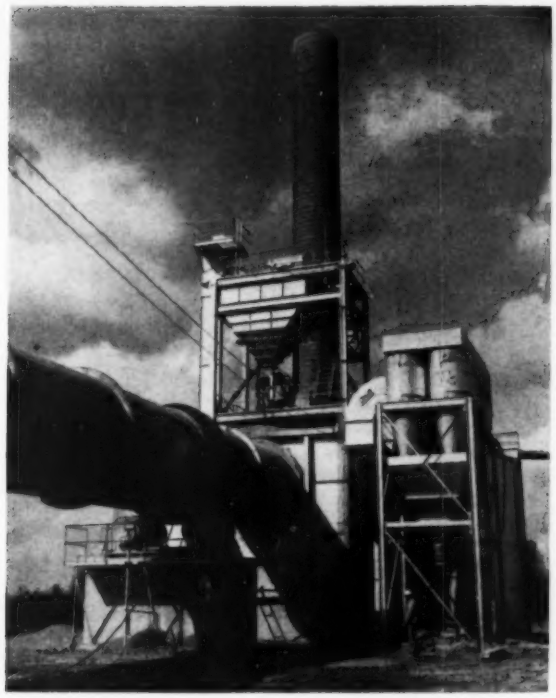
The Square D finish mill control board has Hays draft indicators



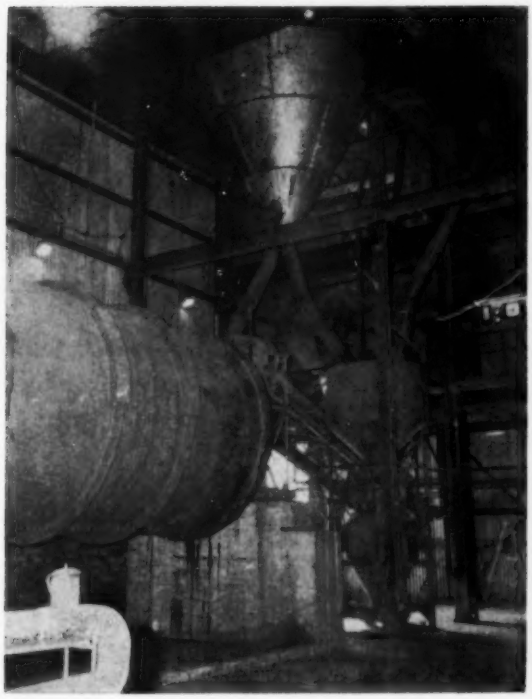
(Left) The 9- by 28-ft. raw-grinding mill with control board (background), rock feed bins, and rock and marl slurry feeders.

Below: The 10- by 8- by 60-ft. air-quenching rotary clinker cooler.





The feed end of the kiln at the Redwood plant with the stack, dust collector, and feed tanks. The dust return elevator, the bin, and the feeder are above.



This view shows the 11- by 18-ft. finish grinding mill with the bin, feed-belt conveyor, 10-ft. separator, air conveyor and control board in the background.

for the dust collector and fan inlet, a Bristol elevator input power indicator, separator and ball mill ammeters, pushbuttons, signal lights, etc.

Storage Packing Cement is discharged through the 4-in. pipeline into the six 10,000-bbl. silos, each 30 ft. in diameter by 60 ft. high. These are built of concrete staves heavily reinforced by closely-spaced round steel bands, and are equipped for air agitation. The silos rest on the packhouse, which is a solid reinforced concrete structure 31 ft. high. Air and screw conveyors and bucket elevators feed the cement to the 3-spout St. Regis packer or to a direct bulk loading point. Kennedy 3- by 6-ft. single-deck screens follow the elevator in each flow to remove any refuse. Bulk trucks stand on a Howe scale platform for loading. A Norblo dust collector serves the packhouse.

Other Officers of the Mississippi Portland Cement Co. include the following: Robert W. Hyde Jr., president; Cecil F. Travis, vice-president; James E. Fowler, secretary; James W. Sanders, treasurer; Henry V. Allen Jr., executive vice-president. Scott Kipping is plant superintendent, Robert E. Knarr is technical director and chief chemist, and Ralph Burcombe is quarry superintendent.

Sales are handled through a separate company, Valley Cement Sales, Inc., with offices in Jackson. W. R. Montgomery is vice-president of this firm, and also functions as general sales manager.

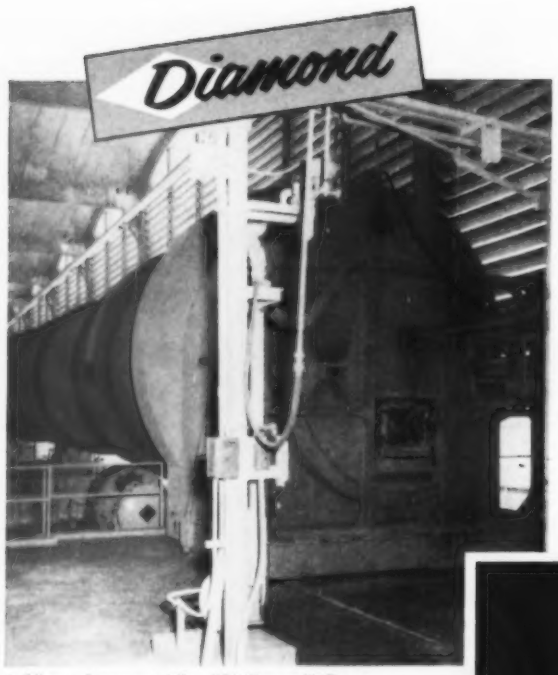
Kenneth D. Cummins Named A.C.I. Technical Director

Appointment of Kenneth D. Cummins, formerly associate professor of civil engineering, University of Detroit, as technical director of the American Concrete Institute was recently announced by the Institute's board of direction in Detroit.

At the University of Detroit Mr. Cummins was engaged in teaching soil mechanics, highway engineering, reinforced concrete design, and structural steel design. In addition to teaching, he has served as consultant on various projects for industrial firms. In December, 1956, he became associated with Decker and McGough, consulting engineers, becoming president of that organization in 1957.

Mr. Cummins' duties for A.C.I. will include field and office work to promote and improve technical relations with other technical societies and organizations, assist member groups in organizing and conducting small local meetings, and upon request, to assist A.C.I. technical committees in preparation of reports.

JAMES P. HASKINS, Clarkdale, Ariz., has been appointed sales representative of the Phoenix Cement Company for northern Arizona. He served for nine years on the Arizona Power Authority Board, which was responsible for getting Arizona a share of the power generated at Boulder and Davis Dams.



▲ View of cement kiln. "Utiliscope" Camera may be seen at right side.

▲ Close-up of "Utiliscope" Camera watching interior of kiln. Air cooled "Utiliport" protects lens against high temperature.

▼ Control Room. Operator sees kiln interior on TV monitor.

Modern Cement Plants Produce

MORE UNIFORM CEMENT CLINKER with DIAMOND "UTILISCOPE" TELEVISION

Camera Operates Efficiently in High Temperature Area . . . Provides Economy and Better Plant Layout

Close observation of the interior of the kiln is important in production of uniform high quality cement clinker. But to station an operator at an observation port on each kiln is inefficient use of man power. Also placing the instruments and controls in that location hinders good plant layout.

This problem was solved in this plant with a "Utiliscope", Diamond heavy duty Television System. A camera was installed on each of the two kilns to "see" the interior. Monitors in the air conditioned control room enable the operator to keep close watch on the burning conditions. He can continually check on the formation of clinker. Instruments and controls are also grouped in this room, so he can make immediate corrections when they are needed.

High ambient temperature (up to 2100°F at the viewing port) was no serious problem. The Diamond air cooled "Utiliport" provides adequate protection to the camera lens. The "Utiliscope" camera, which is built for tough conditions, is air cooled in this installation.

Diamond Heavy Duty Television is built to stand severe service. High temperature, dust, dirt, vibration, etc. do not impair its dependable operation.

This is only one of many ways in which the Diamond "Utiliscope" can save money, improve operation, and help produce a better product. It has been proved in a wide variety of plants and applications.

Explore the possibilities of "Utiliscope" for *your* plant. Write us for more information.

DIAMOND POWER SPECIALTY CORP.

LANCASTER, OHIO *Diamond Specialty Limited, Windsor, Ontario*

0297

Appointments and Promotions

GARRY MEEKER, assistant to the comptroller, has been promoted to budget director of the Riverside Cement Company Division of American Cement Corporation.

LYLE TODD, who joined Riverside in 1941, has assumed the position of assistant comptroller. His former post, chief accountant, will be filled by JOSEPH ORTON. Mr. Orton has been with the firm for 15 years, and became assistant chief accountant in 1955.

WILLARD DAVIS has been named supervisor of new process and new product investigations in the research and development department of Keasbey and Mattison Company of Ambler, Pa. He joined the firm after serving as operations research engineer with Sun Oil Company of Philadelphia.

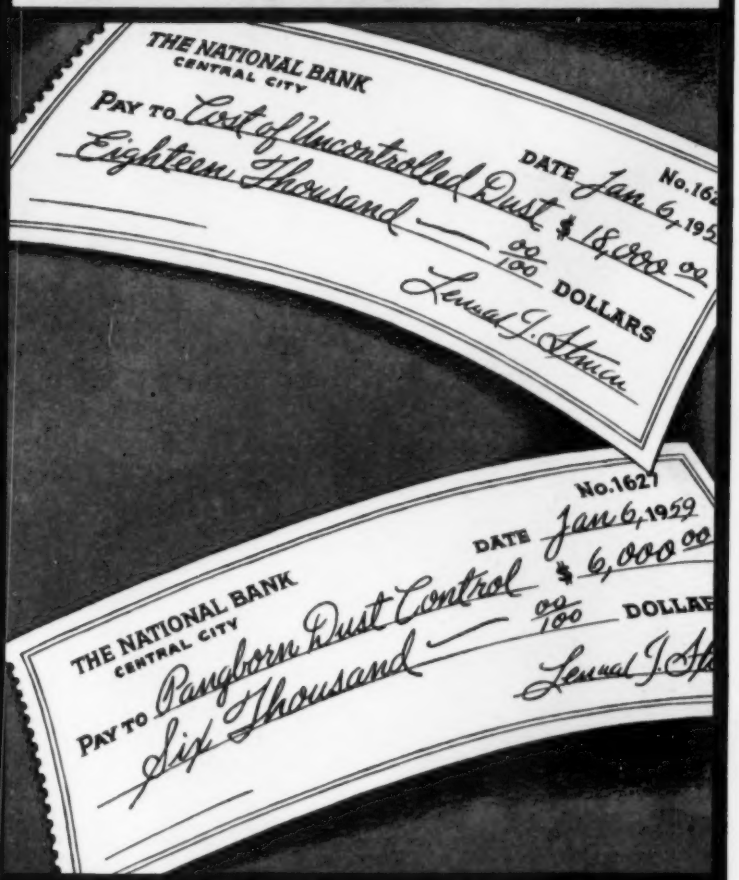
C. J. ATWOOD of United States Gypsum Company, Chicago, has been appointed manager of the newly established Great Plains Division, with headquarters in Kansas City, Mo. Mr. Atwood joined U. S. Gypsum in 1940. He was Dallas district manager from 1956 until his present appointment.

OTTO P. KROEGER has been named superintendent of the Southwest Division of Southwestern Portland Cement Company. He was formerly superintendent of the El Paso plant, having joined the firm in 1929.

FORREST L. HOUSE, assistant superintendent at the plant will succeed Mr. Kroeger.

EDWARD W. DOUGLAS has been appointed general sales manager of the Insulrock Division, Flintkote Company, East Rutherford, N. J. Also promoted at Flintkote was R. J. MULLIGAN, new assistant general sales manager of the Special Products Division. He formerly held the position of sales manager, Insulrock Division.

WHICH CHECK WOULD YOU RATHER WRITE?



How much are you paying for uncontrolled dust?

See for yourself—add up the cost of your lost salvageable material, housekeeping expenses, excess machine wear, intangibles such as community and employee goodwill. Whether your total is moderate or high, Pangborn Dust Control will cost you *less* than uncontrolled dust.

For details on Pangborn's engineering knowledge and experience, talk to the Pangborn man in your area or write PANGBORN CORPORATION, 5300 Pangborn Blvd., Hagerstown, Maryland. *Manufacturers of Dust Control and Blast Cleaning Equipment — Rotoblast® Steel Shot and Grit.*

Pangborn CONTROLS DUST

Enter 151 on card, page 255

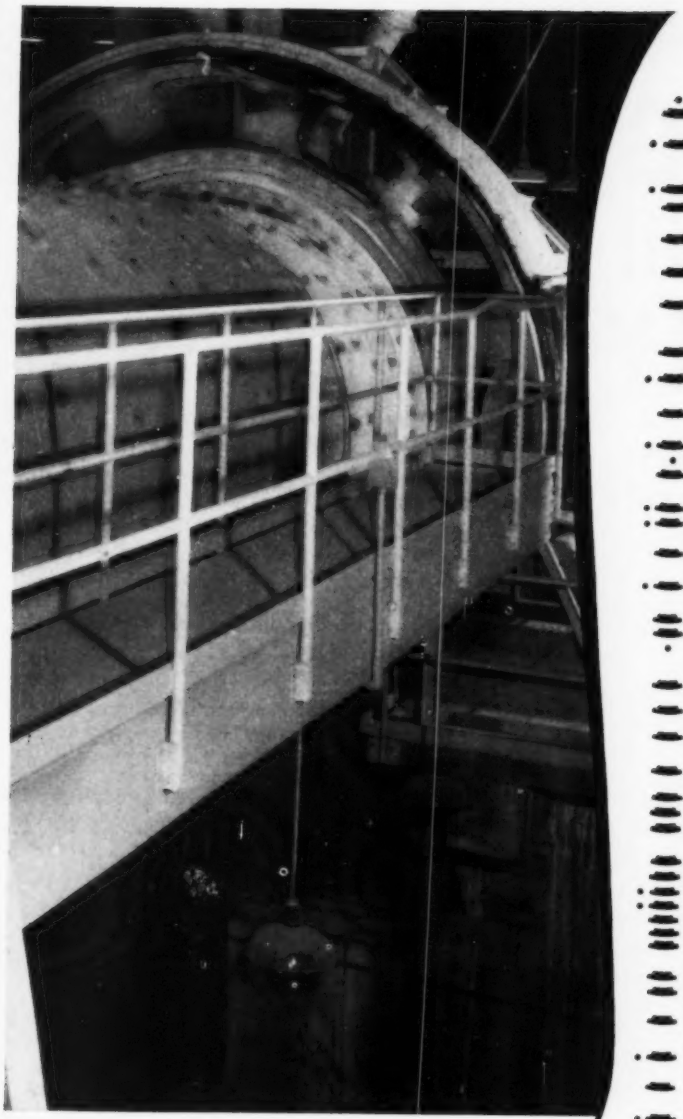
New design clinker mill produces 255 per hour with long-wearing Ni-Hard

The Missouri Portland Cement Company of St. Louis can turn out 255 barrels of cement per hour with its newest mill! This outstanding production is due to the modern design of the mill and to the efficiency of Ni-Hard* nickel-chromium white iron grinding balls.

The new mill has a very short first compartment to complete preliminary grinding of the ⅝-in clinker, which leaves the main length of the mill for the all-important finish grinding.

Ni-Hard grinding balls do this important finish grinding in the 22-ft second compartment so well that the plant's chief engineer says, "The 1-in Ni-Hard media have an almost nil weight loss. The mill charge (175,000 lbs) remains in perfect condition as to size and shape for months, even years. No longer do we experience losses in grinding capacity" [caused by] "loss of media tonnage, reduction in size to ineffective limits from wear, change in shape from spheres to 'sugar cubes' or other odd shapes."

INCO NICKEL NICKEL MAKES ALLOYS



bbls of cement grinding balls

For superior abrasion resistance and high mill efficiency, look to long-lasting Ni-Hard. Ni-Hard grinding balls and mill liners are readily available in all standard sizes from the producers listed on the right. The producer nearest you will be happy to supply all the information you need.

*Registered trademark

THE INTERNATIONAL NICKEL COMPANY, INC.

67 Wall Street INCO New York 5, N. Y.

PERFORM BETTER LONGER

PRODUCERS OF NI-HARD

● Grinding balls ▬ Mill liners

ALABAMA
- American Cast Iron Pipe Co.; P.O. Box 2603, Birmingham 2
- ▬ Thomas Foundries, Inc.; P.O. Box 1111, Birmingham 1

ARIZONA
- ● ▬ National Malleable and Steel Castings Co.; Capitol Foundry Division, Phoenix

CALIFORNIA
- ● ▬ Pacific Ball Mfg. Co.; P.O. Box 106, South Gate
- ▬ Pacific Foundry Co., Ltd.; 3100 19th St., San Francisco

COLORADO
- ▬ Western Foundries; 2000 E. 40th Ave., Denver 5

GEORGIA
- ▬ Georgia Iron Works Co.; 605 12th St., Augusta

IDAHO
- ▬ Coeur d'Alene Hardware & Foundry Co.; 612-616 Bank St., Box 969, Wallace

ILLINOIS
- ▬ American Brake Shoe Co.; Engineered Castings Div., 1322 Main St., Melrose Park
- ● ▬ Frank Foundries Corp., 2020 3rd Ave., Moline

IOWA
- ▬ Eagle Iron Works; 129 Holcomb Ave., Des Moines

MICHIGAN
- ● ▬ Calumet and Hecla Inc.; Calumet Division, Calumet
- ● Engineering Castings, Inc.; 405 S. Linden St., Marshall
- ▬ Stearns Mfg. Co., Inc.; Adrian

MINNESOTA
- ● ▬ Brom Machine & Foundry Co.; 3565 W. 6th St., Winona
- ● ▬ Staver Foundry Co.; Box 74, Virginia

MISSOURI
- ▬ Carondelet Foundry Co.; 2101 S. Kingshighway Blvd., St. Louis 10

MONTANA
- ● ▬ Caird Engineering Works; P.O. Box 837, Helena

NEW JERSEY
- ▬ Abrasive Alloy Castings Company; Bridgeboro
- ▬ American Abrasive Metals Co.; 460 Coit St., Irvington 11
- ● Grinding Balls, Inc.; Delanco

NEW YORK
- ▬ American Brake Shoe Co.; Engineered Castings Div., 530 Fifth Ave., New York 36
- ▬ American Brake Shoe Co.; Engineered Castings Div., 10 Mount Read Blvd., Rochester 11
- ▬ Plattsburg Foundry & Machine Co.; 18 White Street, Plattsburg

OHIO
- ▬ The Babcock & Wilcox Co.; 161 E. 42nd St., New York 17 (Plant: Barberton, Ohio)
- ▬ Oak Hill Fdry. & Machine Works, Inc.; P.O. Box 278, Oak Hill
- ▬ Stark Foundry Co.; P.O. Box 147, Station A, Canton 5
- ▬ Unitcast Corporation; Box 8, Station "E", Toledo 9

PENNSYLVANIA
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- ▬ Kennedy Van Saun Mfg. & Engrg. Corp.; Danville
- ● ▬ New Castle Foundry Co.; Mahoning Ave. & Hobart St., New Castle
- ● ▬ The Pennebacker Co., Inc.; P.O. Box 126, Emmaus
- ▬ Sprout, Waldron & Co., Inc.; Sherman St., Muncy
- ▬ Treadwell Engineering Co.; 25th & Lennox Street, Easton
- ▬ Weatherly Fdr. & Mfg. Co.; Commerce St., Weatherly

TENNESSEE
- ▬ Keller Foundry Co.; 1010 E. Jackson Ave., Knoxville
- ▬ Kingsport Foundry & Mfg. Corp.; East Sullivan & Main Sts., Box 709, Kingsport
- ▬ Ross-Meehan Foundries; 1601 Carter St., Chattanooga 1

TEXAS
- ● ▬ Darbyshire Steel Co., Inc.; P.O. Box 352, El Paso

UTAH
- ▬ Lundin & May Foundry Co.; 454 West 5th North, Salt Lake City 10

WASHINGTON
- ● ▬ Union Iron Works; Box 2135, Spokane 10

WEST VIRGINIA
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- ▬ Lethbridge Iron Works Co., Ltd.; 120 First Avenue S., Lethbridge
- ● ▬ Standard Iron & Engr. Works, Ltd.; 120th Ave.–107th St., Edmonton

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- ▬ The Cobalt Foundry, Ltd.; Cobalt
- ▬ The William Kennedy & Sons, Ltd.; Owen Sound
- ▬ Soo Foundry & Machine Co., Ltd.; Sault Ste. Marie
- ▬ Stephens-Adamson Mfg. Co. of Canada, Ltd.; Foundry Division, Belleville
- ● ▬ The Wabi Iron Works, Ltd.; P.O. Box 20, New Liskeard
- ▬ Welland Electric Steel Foundry, Ltd.; P.O. Box 458, Welland

QUEBEC, CANADA
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- ● ▬ Quebec Iron Foundries Ltd.; P.O. Box 369, Mont Joli
- ● Quebec Iron Foundries Ltd.; Noranda

Enter 154 on card, page 255

NORDBERG Cement Mill MACHINERY

...quality-built to give you longer service life—lower operating costs

Recognized by the cement industry for its quality construction and resulting ability to assure maximum, continuous production at low operating cost is the extensive line of dependable Nordberg machinery.

Nordberg cement machinery includes Symons® Gyratory Crushers for primary crushing of raw materials; Symons Standard and Short Head Crushers for preparation of finely, uniformly sized raw mill feed; Symons Vibrating Grizzlies and Screens for scalping and sizing; wet and dry grinding rod, ball, tube and compartment mills; rotary dryers, kilns and coolers.

For dependable, low cost power, a complete line of Nordberg Diesels, in sizes to more than 11,000 hp are available to meet practically any cement industry power requirement.

If you are looking for ways to increase operating efficiency and lower production costs, it will pay you to investigate the advantages of Nordberg machinery and the technical engineering services available.

SEND FOR CEMENT BROCHURE

This brochure illustrates the full line of quality Nordberg machinery designed and built for more efficient cement plant operation. Write for your copy today.

NORDBERG MFG. CO., Milwaukee 1, Wisconsin

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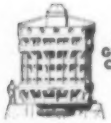
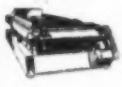

SYMONS GYRATORY CRUSHERS

SYMONS CONE CRUSHERS

NORDBERG MINE HOISTS

SYMONS VIBRATING GRIZZLIES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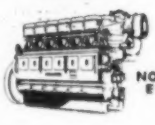
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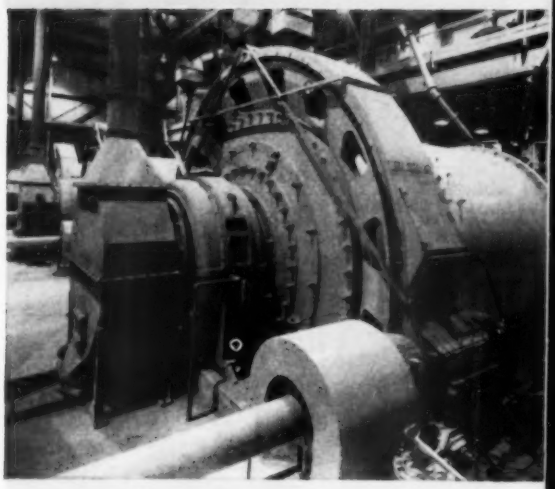
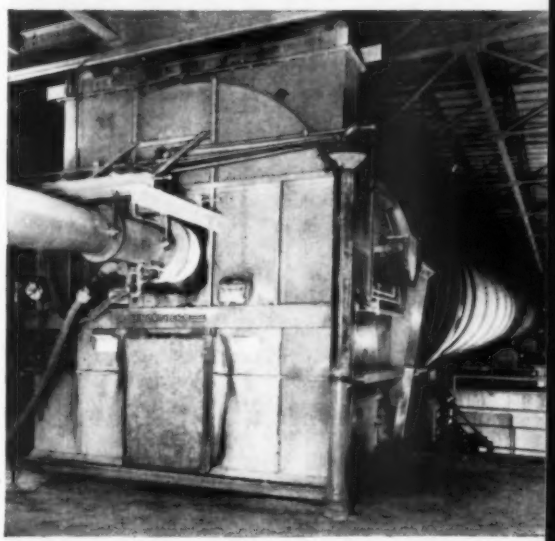


Directly above is a view showing one of three 11′ x 17′ Nordberg Grinding Mills recently installed for finish grinding operations at a large Midwest cement plant.

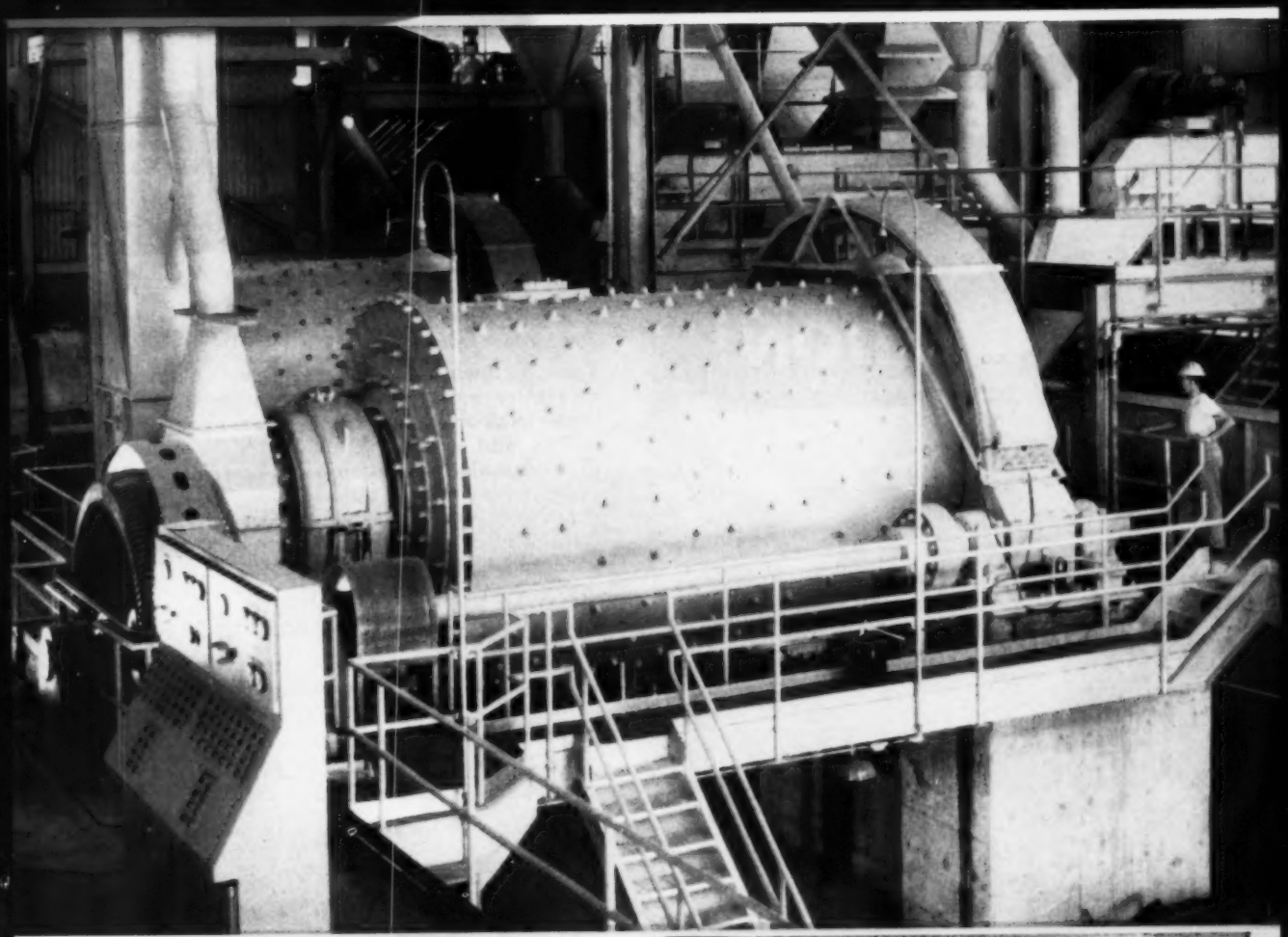
The large illustration at the right shows part of a group of five 11′ x 17′ Nordberg Grinding Mills installed for dry process service at a newly completed cement plant.

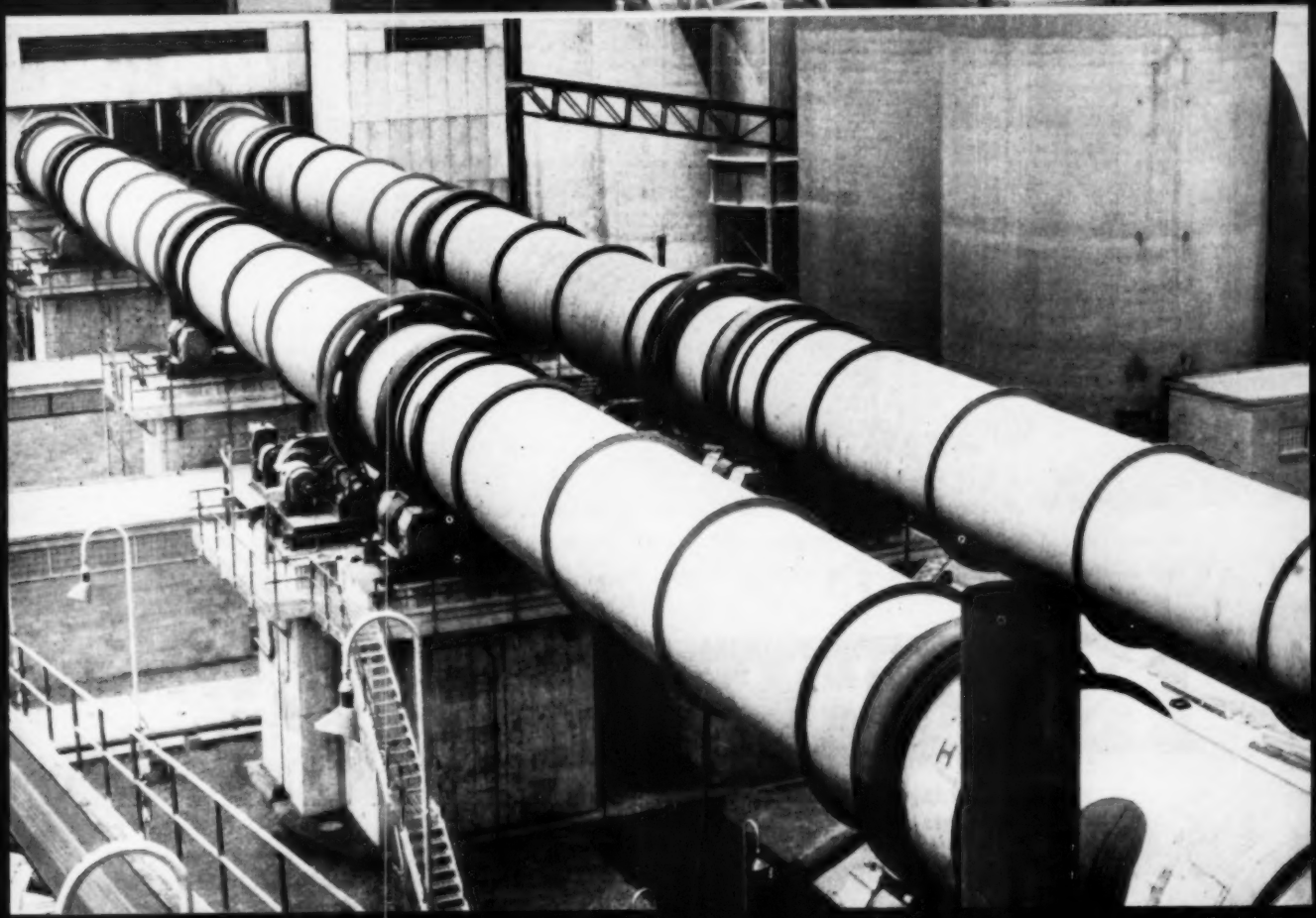
Illustrated at the right are two 11′ diameter x 360′ Nordberg Rotary Kilns installed during the recent expansion of a large Midwestern Portland Cement plant.

Shown directly below is a close-up view of a new Nordberg Rotary Kiln used in cement processing. Shown from the firing hood end, this unit measures 11′ in diameter x 380′ in length.



SYMONS . . . a registered Nordberg trademark known throughout the world.





KEEPING THE CRUSHER AT MAXIMUM PRODUCTION!

Your shovel is your aggregate producing "factory." Production depends on that steady output that a *real* Rock Shovel can give you. Here is another of the many Model 41 Shovels in Colorado. This one is in the pits of the Whitewater Sand & Gravel Co., Grand Junction, Colorado.

All Northwest Shovels are Rock Shovels and the Model 41 is no exception. The Model 41 is a full 1 yd. Rock Shovel—not "built up," not modified from another capacity, but built from the ground up as a full 1 yd. rig capable of the output and performance you expect from a 1 yd. Shovel.

Your Northwest Model 41 doesn't waste time! There's no stutter — no restarts — no dipper juggling either in the bank or getting the load in the truck. The cycle is fast and smooth. The "Feather-Touch" Clutch Control makes operation easy. The Northwest Dual Independent Crowd utilizes force most other independent crowd shovels waste. The Uniform Pressure Swing Clutches take hold smoothly — free from jerks and grabs — the dipper is up through the bank and over the truck in a hurry.

These are things that make big output figures!

Here is a machine it will pay to ask questions about. If you need a 1 yd. machine and want a real 1 yd. *built as a 1 yd.* ask a Northwest Man to give you complete details.

NORTHWEST ENGINEERING COMPANY
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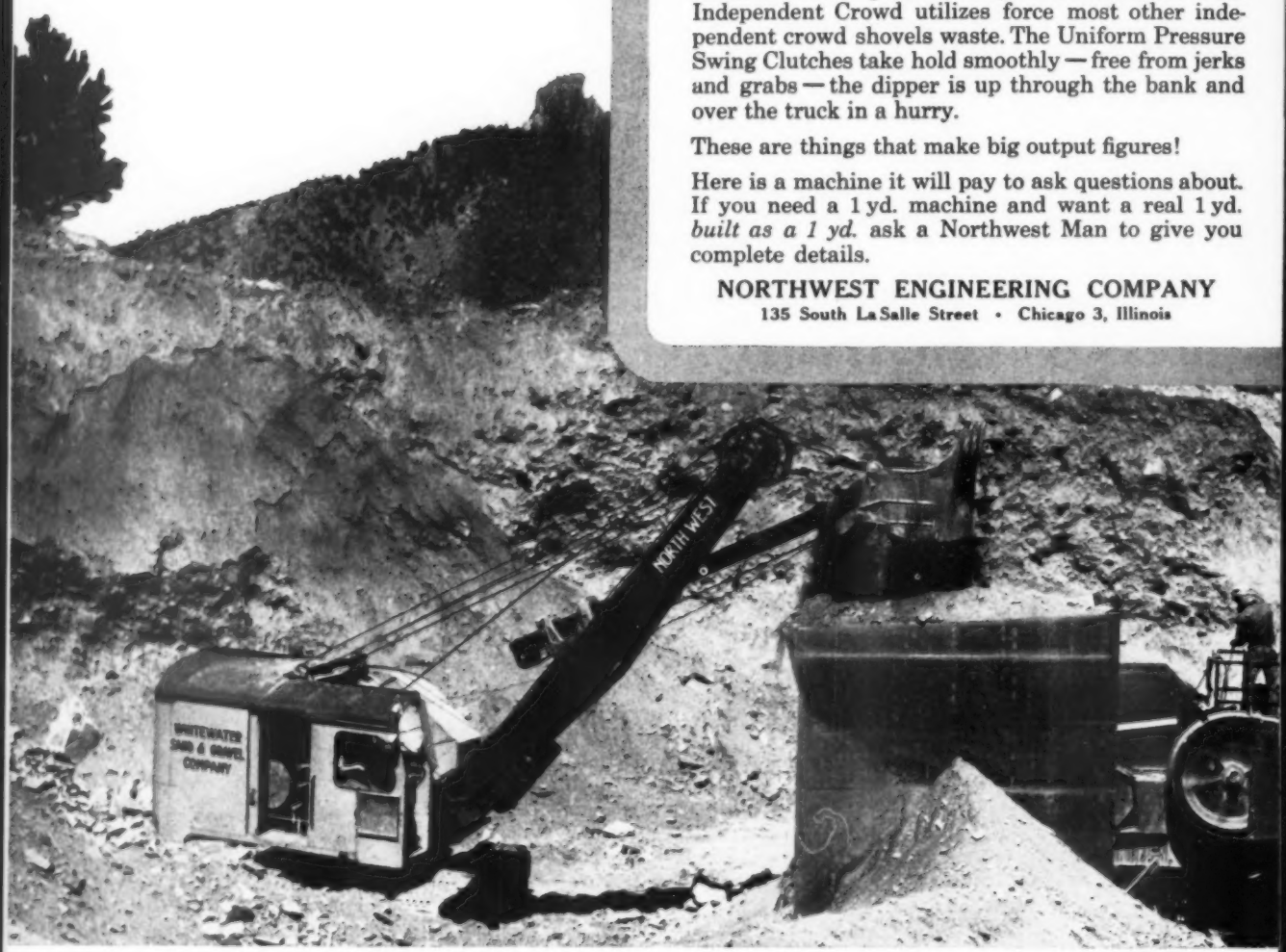

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NORTHWEST EQUIPMENT IS BUILT IN THE FOLLOWING SIZES

SHOVELS	CRANES	DRAGLINES	PULLSHOVELS	TRUCK CRANES
¾ Yd. to 2½ Yd. Capacity	13-Ton to 50-Ton Capacity	¾ Yd. to 3 Yd. Capacity	¾ Yd. to 2½ Yd. Capacity	25-Ton and 35-Ton Capacity

BRADLEY HERCULES MILLS

HOW TO INCREASE CEMENT PRODUCTION UP TO 50%...

The capacity of an existing tube or compartment mill can be increased up to 50% or even higher simply by installing a Bradley Hercules Mill as a preliminary pulverizer on either the dry raw or finish side. Yet this increased production of cement raw material or finished cement is obtained at no increase in horsepower consumption per ton or barrel produced. The Hercules automatic electrical feed control eliminates manual operation. Rugged construction . . . dustless operation . . . easy accessibility to grinding parts keep maintenance costs at an absolute minimum. That's why so many in the cement industry rely on the Hercules Mill for increased production of finished material.

See Chemical Engineering Catalog or for complete information, write for Catalog No. 63

BRADLEY PULVERIZER CO. LONDON ALLENTOWN, PA. BOSTON

superior grinding equipment since 1891

Filters and Filter Media

By RICHARD F. O'MARA
and
CARL R. FLODIN
O'Mara and Flodin, Inc.
Los Angeles, Calif.

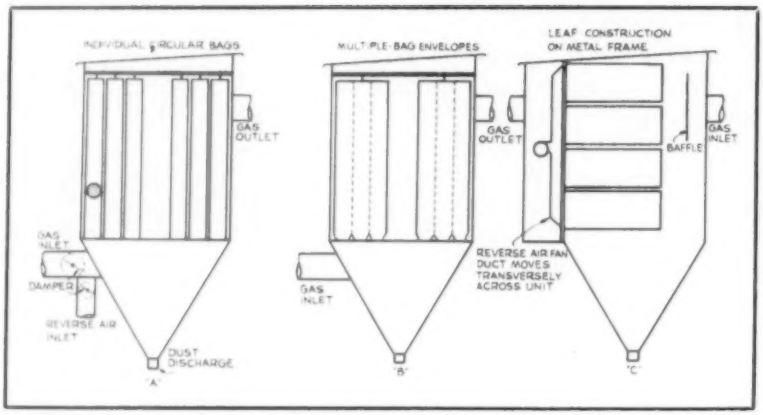

Fig. 1—Three types of filters used in cement plants.

INTRODUCTION

FABRIC filters of various types have long been the most common method of removing dust for many cement mill operations. The main exception was the cleaning of waste kiln gases. However, recently filters have also come into use for the cleaning of waste kiln gases from both wet- and dry-process kilns.

Through the years widely varying designs have been developed. These are in a constant state of improvement; for example, metal frames have taken the place of wood frames. Recently many new filter media have become available through the constant development and improvement of synthetic materials.

In the ordinary cement plant, 20 to 30 percent of the total waste gas to the atmosphere passes through fabric filters. Filters are commonly used throughout crushing plants, as well as for the ventilation of transfer points, conveyors, elevators, Airslides, bins, and bagging equipment (See accompanying chart.)

This article is based on a paper by the authors, presented at the 51st annual meeting of the Air Pollution Control Association in May, 1958. It has been revised and brought up to date.

Filter Designs

The oldest and most common design is the stocking or tube—either circular or oval individual bag. The bag diameter to length ratio is usually kept within a range of 20 to 25. Bag diameters generally vary from about 4½ in. to 12. (Figure 1 A)

In operation, the oval type of bag becomes cylindrical; and when the air flow is stopped, it reverts to its oval shape which tends to remove the dust.

Multiple-bag envelope type construction allows for approximately 10 percent more cloth area in a given cross-sectional area. These are envelopes that are sewn so that in operation they become a group of circular elements. There is a seam at the top and several individual round connections in the bottom for fastening to the tube sheet. (Figure 1 B)

In the leaf-type construction the cloth covers a metal frame that may be as large as 4 by 6 ft. This forms a panel which is fastened in either the horizontal or vertical plane in the filter. Dust is collected on the outside of the panels and removed by various means. (Figure 1 C)

Filter Media

Over the years, the most common fabric employed as a filter medium has been cotton. Cotton bags have been used for cleaning vent air from such sources as silos and bins, vibrating screens, transfer points on conveyors and elevators, Airslides and Fuller-Kinyon conveying systems, raw mills, and finish mills. The factors that dictated the use of cotton were low cost and suitability for the service.

Wool was not generally used in the cement industry. It is more expensive than cotton and is not required here, as is the case in the nonferrous metallurgical industry, because of its greater resistance to attack by sulphur compounds.

In recent years a number of synthetic fibers have become available. Some of these are Dacron, Dynel, Nylon and Orlon. Rayon and Teflon are available as filter cloth. Teflon is currently too costly for this service. Rayon has not proved particularly satis-

for the Cement Industry

factory. The two of these materials that have had the greatest promise are Dacron and Orlon. (2) (3)*

Felted Orlon was found to be a suitable filter material for use with the Hersey type reverse-jet filter. For filter purposes this material is supported on an open weave base fabric. Orlon fabric has been used because of its resistance to possible chemical attack and abrasion. The maximum continuous operating temperature should not exceed about 250 deg. F.

Heat-set Dacron is a suitable material for filters up to a continuous operating temperature of 275 deg. F. It is used as a monofilament woven fabric and has a very smooth surface. (4)

Nylon is used for complete bags up to temperatures in the range of approximately 200 deg. F. It is not generally used for higher temperatures because of shrinkage.

Dacron and Nylon are also used for cuffs on cotton bags, to resist abrasion, and to increase the useful life. However, some plants are trying cotton and Dacron bags without cuffs.

Dynel is a rather high-priced material with very good corrosion-resistant characteristics; it is used mostly for wet filtration in chemical plants. It is not generally used for dry dust filtration.

The accompanying table gives comparative properties of Du Pont fibers.

The newest filter medium is heat-

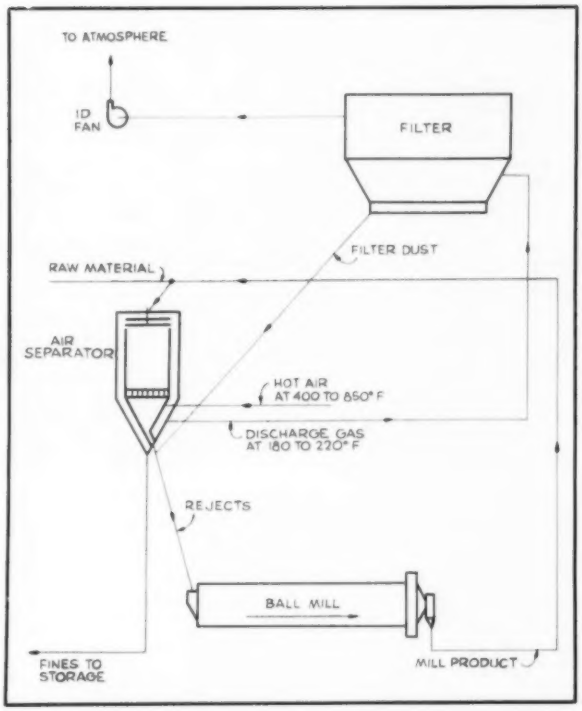

Fig. 2—Raw mill drying, grinding, and separating circuit diagram.

Summary of Properties of Du Pont Fibers
(Arranged in Order of Performance)
Courtesy of E. I. duPont de Nemours & Company (Inc.)

Resistance to Dry Heat	Resistance to Acids	Resistance to Alkalies	Resistance to Oxidizing and Reducing Agents
Teflon*	Teflon	Teflon	Teflon
Dacron**	Orlon	Nylon	Dacron
Orlon***	Dacron	Dacron	Orlon
Nylon	Nylon	Orlon	Nylon

Resistance to Moist Heat	Resistance to Abrasion (Wet and Dry)	Tensile Strength
Teflon	Nylon	Nylon
Orlon	Dacron	Dacron
Nylon	Orlon	Orlon
Dacron	Teflon	Teflon

*Du Pont's registered trademark for its tetrafluoroethylene fiber
**Du Pont's registered trademark for its polyester fiber
***Du Pont's registered trademark for its acrylic fiber

*Numbers in parenthesis refer to the bibliography at the end of this article.

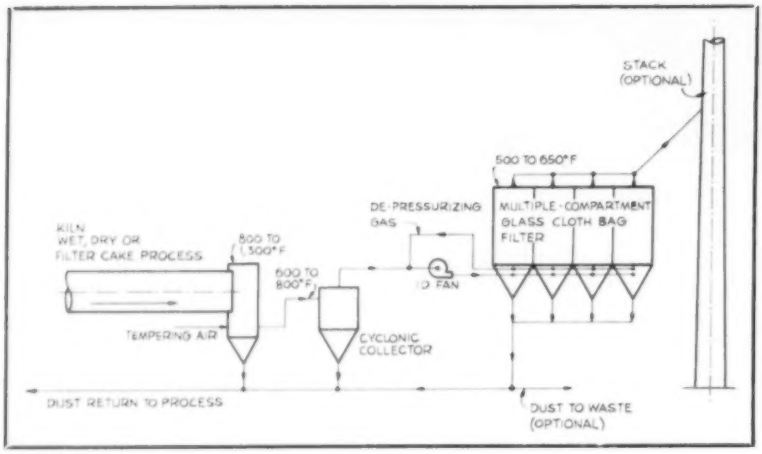

Fig. 3—Kiln gas cleaning.

treated, silicone-coated glass cloth. It is supplied in woven fabrics. Its recommended maximum continuous operating temperature is in the range of 500 to 650 deg. F.

Filter media are available in a wide variety of fibers, counts, weaves, and weights; and they are supplied to meet the specification of bag manufacturers. The selection of the desired combination of factors for use in various applications depends on the experience and preference of the manufacturer or user.

The most commonly used weaves are chain, twill, and satin.

An important index to the filtering characteristics of filter media is its porosity or permeability. Permeability is defined as the cubic feet per minute of air passing one square foot of filter medium at ½ in. w. g. draft loss at ambient temperature. It should be noted that this is determined with clean air and is not directly applicable to the filtering ratio in a dirty gas stream. As used in cement plant practice, permeability may vary from about 10 to 35, depending upon the type of weave and the filament characteristics of the fabric. Different permeabilities are used for various applications. Cotton ordinarily has a permeability of about 15.

The following are approximate comparative costs of various filter media:

Cotton	1
Orlon	2.5
Nylon	2.5
Dacron	2.5
Glass	3.0

Methods of Dust Removal

As usual with most dust-separating apparatus, the separation of the dust from the gas stream is only a part of the problem. Frequently the real problem is the removal of the dust from the separator. Automatic shakers that give either vertical or lateral motion to the bags are arranged in many ways and can be operated through pneumatic, mechanical, or electrical means.

Almost all types of filters are arranged (or can be arranged) so that the gas flow can be shut off and some gas allowed to flow back through the bag to assist in cleaning. This reverse air can be provided by a high-pressure jet with a moving ring, such as in the Hersey type of construction; or it can be provided by a fan either inside or outside the filter casing proper.

Some filters are provided with dual dampers so that when a compartment is shut off for cleaning, it is opened to atmosphere, and the fan pulls atmospheric air or warm clean air through for reversing flow. For continuous service, this requires multiple-compartment construction.

With glass cloth bags, the gas flow to individual compartments is cut off and reversed with a time cycle control. This allows the bags to deflate for removal of the collected dust. The cleaning cycle can vary from 30 minutes to 2 hours.

Raw and Finish Mill Systems

In raw mills, filters are used for ventilation of the mill circuit. Where air separators are equipped with furnaces to provide drying, filters are used for cleaning of the moisture-laden air from the air separator. (Figure 2)

Air separators on finish mills are often arranged so that large volumes of ambient air are pulled through the separator to remove some of the heat generated in grinding. In such cases the filter is connected to the warm air discharge from the separator. (5) (6)

Coal Pulverizers

Cotton fabric filters have been used to some extent for the cleaning of coal pulverizer vent gases, but these are subject to fire and explosion hazard. More recently, experiments have been under way with the application of glass cloth filters for this service.

Waste Kiln Gas Cleaning

A large installation of wool cloth was made on a wet-process kiln installation as far back as 1927. Gas temperatures from the kiln were reduced by passing through a waste

Filter Applications

Application	Ventilation of Material-Handling Systems	Raw Mills Air Separator	Finish Mills Air Separator	Coal Pulverizer Vents	Kilns Wet or Dry Process
Deg. F.	Ambient	160 to 220	160 to 220	Ambient to 180	400 to 650
Grains, Cu. Ft.	5 to 10	75 to 250	75 to 250	5 to 75	2 to 12
Pressure Drop in. W.G.	3	3 to 4	3 to 4	3	2 to 6
Filter Media	Cotton Orlon Nylon	Cotton Orlon Dacron	Cotton Orlon Dacron	Orlon Wool	Glass
Dust Removal: Shake and/or Reverse Flow	x	x	x	x	x
Deflating Bags					
Compartmented and Dampered Continuous Automatic	x	x	x	x	x

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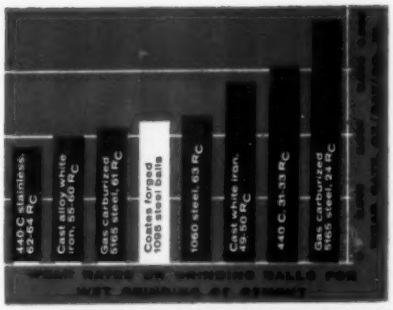
440 C stainless, 62-64 Rc
Cast alloy white iron, 58-60 Rc
Gas carburized SAE 1065 steel, 61 Rc
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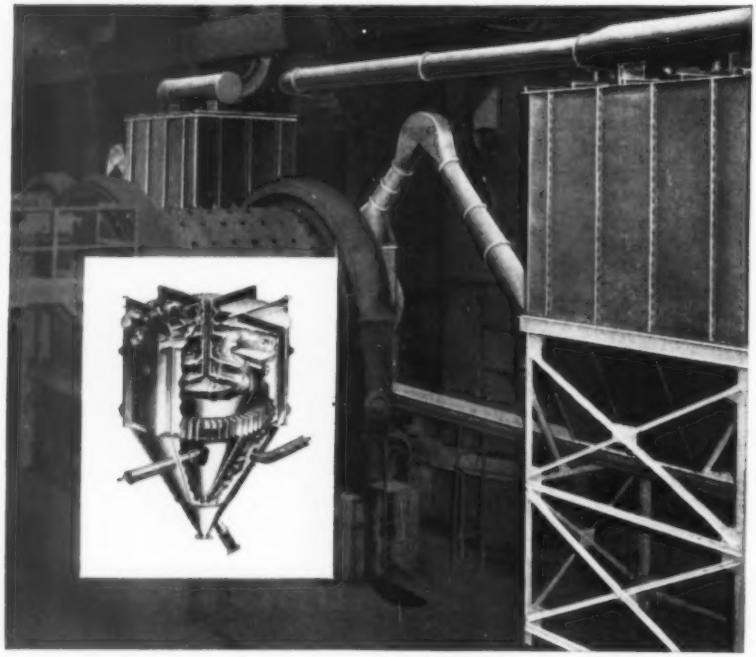

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heat boiler immediately after the kiln, followed by a heat exchanger of the plate type, and entered the collector at about 220 to 240 deg. F. This method did not meet with any widespread acceptance in the industry due to the large size and high first cost of the installations, as well as to high power and maintenance costs. Average bag life was around nine months.

With the development of synthetic fibers that will withstand higher temperatures, pilot work was done with various types, including glass cloth.

The advent of glass cloth appeared to have real promise for this application. However, although much money was spent and pilot plant installations were made, various shaking methods for removal of the dust without failure of the glass filter medium were unsuccessful, and the idea lay dormant for 10 to 15 years.

Three pilot plant glass cloth filter units on waste kiln gas were observed in Germany in 1955. However, at the time of the inspection none were in operation. One used a rotary arm blow-back between glass covered panels, and the other two used a reverse flow and moderate rapping on glass-covered panels.

Two installations of this German development were made in this country. So far as is known, neither one is currently in operation.

New properties have now been provided for glass cloth by first passing it through a flame to remove the sizing or starches needed in the manufacture of the fiber. It is subsequently passed through an aqueous emulsion of silicone and then heat-set at 500 to 600 deg. F. This gives a very smooth finish. It is water-repellent and has a very soft, flexible texture. It makes an excellent filtering surface since dust dislodges from it easily. Very few materials will stick to this silicone-treated surface. It is even difficult to attach Scotch tape. Its application for the cleaning of cement kiln gases passed through several stages.

One of the large cement companies installed a suspension-type heat exchanger on the feed end of kilns in one of its plants. The waste gas, after passing through mechanical collectors, went through a tubular-type heat exchanger to reduce

the temperature and was then vented to an orlon bag filter.

No satisfactory means to keep the heat exchanger surfaces clean was developed, and the temperature without the heat exchanger was too high for orlon. About this time, this same company had a pilot glass cloth unit in another plant taking gases from a wet-process kiln. This setup consisted of four bags, 11½ in. in diameter by 15 ft. long, and it was arranged for mild shaking. Heavy shaking of silicone-treated glass cloth reduces bag life.

This pilot plant unit had been operating for some time when it was discovered that the shaking mechanism had not been operating but that the unit was functioning satisfactorily. It was arranged to operate under pressure with the fan shut down for less than a minute out of each hour's operation by time cycle control. This allowed the bags to collapse gently and the dust to fall into the hopper. As a result of this discovery, glass bags were installed on the preheat kilns to replace the orlon bags.

In the meantime, this cement company has continued to pioneer this development. It has designed and installed a full-size glass cloth bag filter taking all the gases from a 2,500 bbl. per day wet-process kiln. The gas volume is about 100,000 cu. ft. per minute at 550 deg. F. This installation has been in use since October, 1957, and is still operating.

This installation consists of 12 compartments and operates under pressure. The gas flow to each compartment is cut off for approximately one minute at periodic intervals, and cleaning is effected by deflating or flexing of the bags. Since a low-sulphur raw material, with natural gas as fuel, is being used, the installation is allowed to vent directly to the atmosphere without a stack. It is so arranged that cooling air is drawn up around the bags by stack effect, and the cloth temperatures never reach the incoming gas temperatures. The pressure drop is 2.5 to 4.0 in. of water. (Figure 3 is a typical diagram.)

It is possible to walk into the cloth filter enclosure and around the various compartments with no throat or eye irritation. There is no visual discharge.

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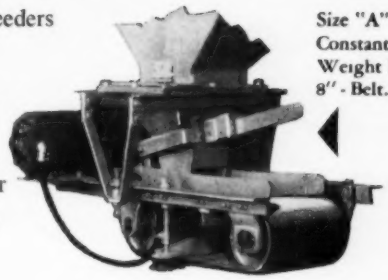

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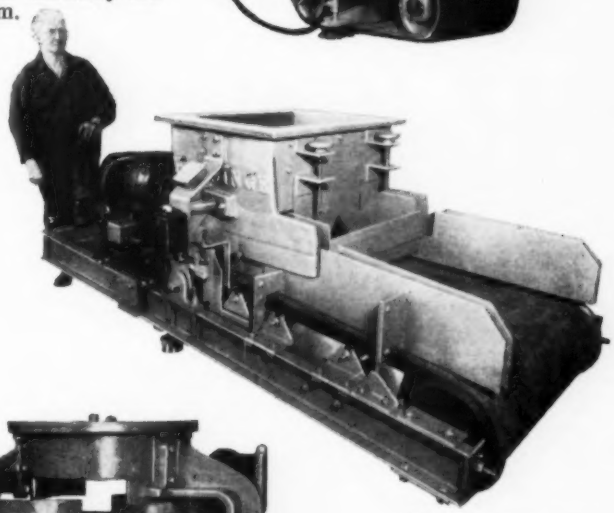

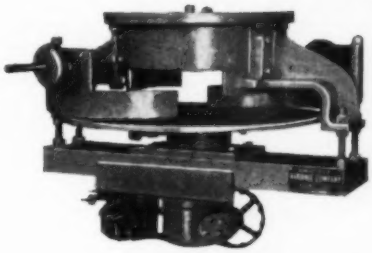

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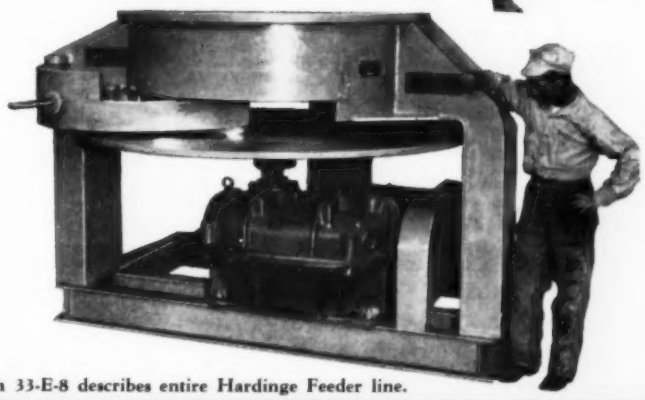

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At an eastern cement plant two pilot units were tested. One of these had four bags, 11½ in. in diameter by 15 ft. long. The other had 48 bags, 4½ in. in diameter by 6 ft. long. A compressed-air shock wave was used for dust removal.

Another cement plant had a four-bag pilot unit in operation for 10 months, and a 6000-cu. ft. per minute test installation in operation since August, 1957. The pressure drop on gases as they come directly from the kiln is lower than it is after they have passed through mechanical collectors.

During early experimental work it was thought that the alkalis in cement kiln gases would not be compatible with glass cloth fibers. However, in one plant relatively high alkali dust has now been collected since May, 1957, and the glass cloth has neither blinded nor has it given any indication of deterioration.

The dust recovered in glass cloth filters following mechanical collectors in two separate plants has a particle size range of 65 to 70 percent minus 10 microns.

In general, the cloth-to-gas ratios for these applications are in the range of from 1:2 to 1:3.5. Pressure drops are in the range of 2 to 3.5 in. w.g., with exceptional cases as high as 5 to 6 in. w.g.

Glass cloth filters show considerable promise for the treatment of waste gases from both dry- and wet-process cement kilns. However, some time is required before sufficient operating experience on various types of plants will be available to evaluate fully economic factors such as power requirements and maintenance, particularly bag life.**

One large cement company has an installation on a limestone and clay dryer. The original one was orlon, which lasted about two months. Glass has been in service since the middle of 1957, and it still appears to be in good condition.

Preventive Maintenance

One of the most important considerations for filters in the cement industry is a program of preventive maintenance.

Shaking-type filters should be checked at regular intervals to be sure that all of the shakers are functioning properly. Since none of the filters operate at 100 percent efficiency, some small amount of dust always passes through, particularly during shaking. It is desirable that this dust be vacuumed out and the tube sheets kept clean. If dust is allowed to accumulate to any depth in the filter, it impairs the operation and shortens the life of the filter cloth.

Patching materials are available for all types of bags.

It is ordinarily recommended that when a unit is taken out of service for maintenance, all of the bags in the unit be removed and replaced with a new set of bags or with a set

**Since this paper was presented, a great deal of interest has developed in the application of glass cloth fibers for cement kiln gases. There are presently six different suppliers, who have quoted a variety of types of glass cloth. Fabrics varying from 6 ounces to 16 ounces in weight and from 10 to as high as 80 in permeability are currently being tried in the field.

Although some cement companies are fabricating and installing their own glass cloth filters, others are obtaining installations from the equipment suppliers.

At present there are several installations in operation, and a large number are in the process of fabrication and installation. These will have a total gas-handling capacity in the neighborhood of 1,500,000 c.f.m. —The Authors

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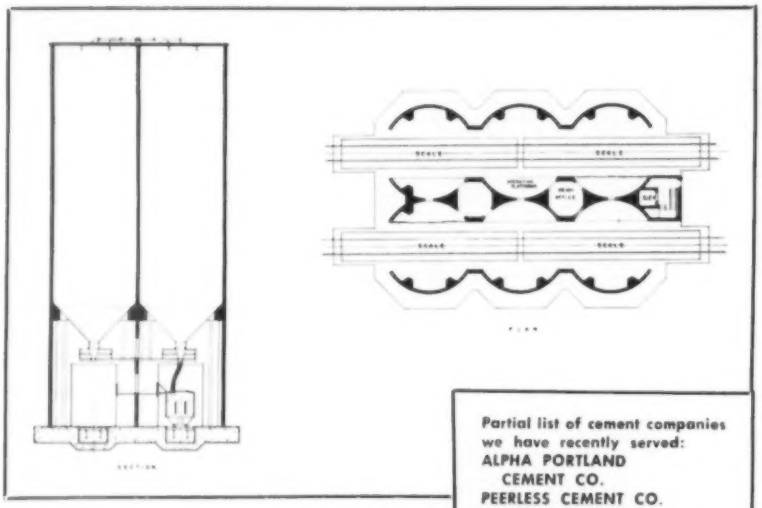

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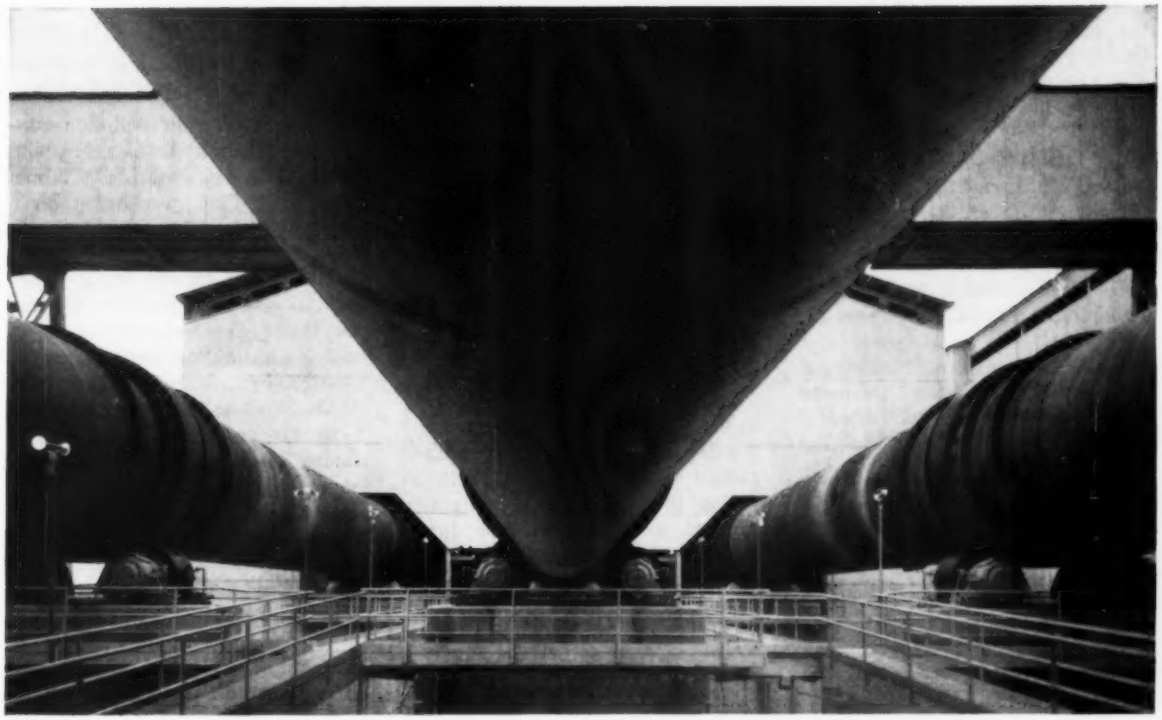

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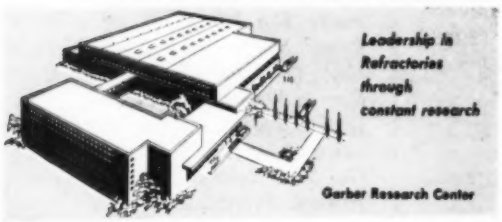

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Market Recovery Expected By Japanese Cement Makers

Indications of a market recovery in the Southeast Asian countries for the Japanese cement industry have caused Japanese manufacturers to revise their production programs upward, according to the Japan Cement Association. Japan's cement exports in the 1958-1959 fiscal year totalled 1,477,022 tons, or a decrease of 520,000 tons from the preceding year.

Signs of export improvement include South Vietnam plans to buy 60,000 tons of cement from Japan with funds supplied by the International Co-operation Administration of the United States of America.

Air Pollution, Gas Cleaning Basis of Seminar Sponsored By Research-Cottrell, Inc.

A seminar on air pollution control and industrial gas cleaning, held April 22 at the Engineers' Club in New York City, was based on a program designed to provide background information on air pollution problems, the present status of industrial gas cleaning technology, and the future direction of related research and development. Research-Cottrell, Inc., was host and sponsor of the day-long seminar.

In his introductory remarks, James M. Knox, president of the company, stated: "The extent of industry's efforts to reduce air pollution and recover useful materials and the vast sums expended by industry for that purpose is not generally appreciated. Industry currently is spending an estimated $500,000,000 annually for control equipment, personnel, and research."

Guest speaker at the seminar was Dr. Leslie Silverman, professor engineering in environmental hygiene, School of Public Health, Harvard University who spoke on *Future Needs in Air Pollution Control.*

Principal speakers and their subjects were as follows: L. M. Roberts, senior vice-president—*Future Requirements of Industrial Gas Cleaning as Applied to Electrostatic Precipitation;* Dr. Harry J. White, director, research and development —*Gas Cleaning and Research Development—Present Fields of Work and Projections;* and Richard W. Sickles, technical supervisor, operations and service section—*The Need for Uniform Performance Testing Standards.*

Other Research-Cottrell men led panel discussions on the following topics: *Recent Developments in Rapping of Electrical Precipitators; The Importance of Gas Flow Model Studies to Good Precipitator Design and Operation; The Application of a Mechanical Collector in Combination With an Electrostatic Precipitator; The Elements of a Good Power Supply System for Electrostatic Precipitation; The Relation of Size to Performance in Precipitator Design and Operation; The Importance of an Effective High Voltage Gas Seal; Balanced Design in Electrostatic Precipitation.*

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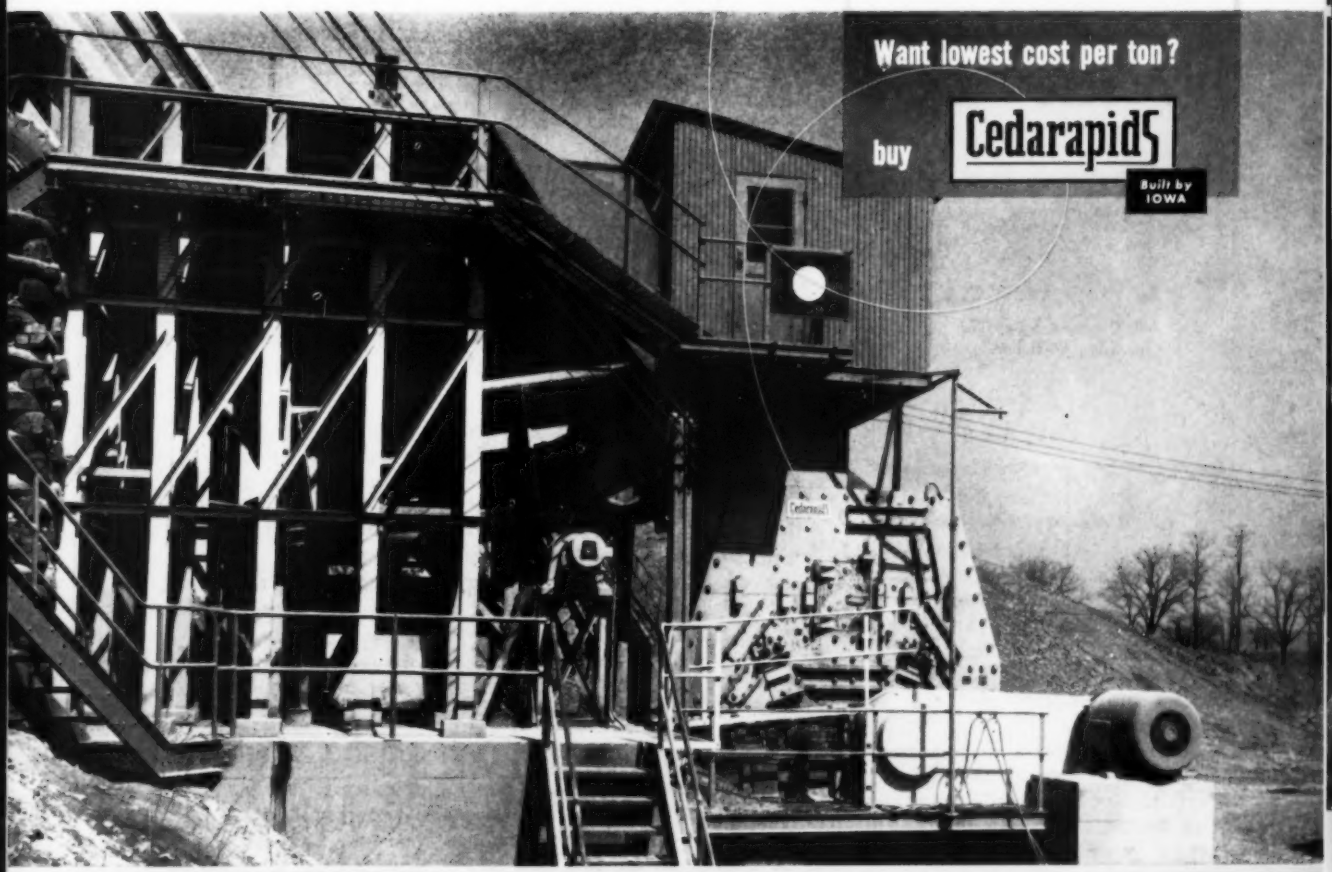

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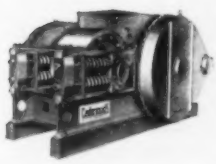

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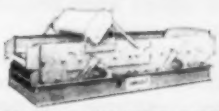

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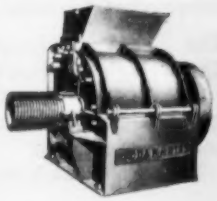

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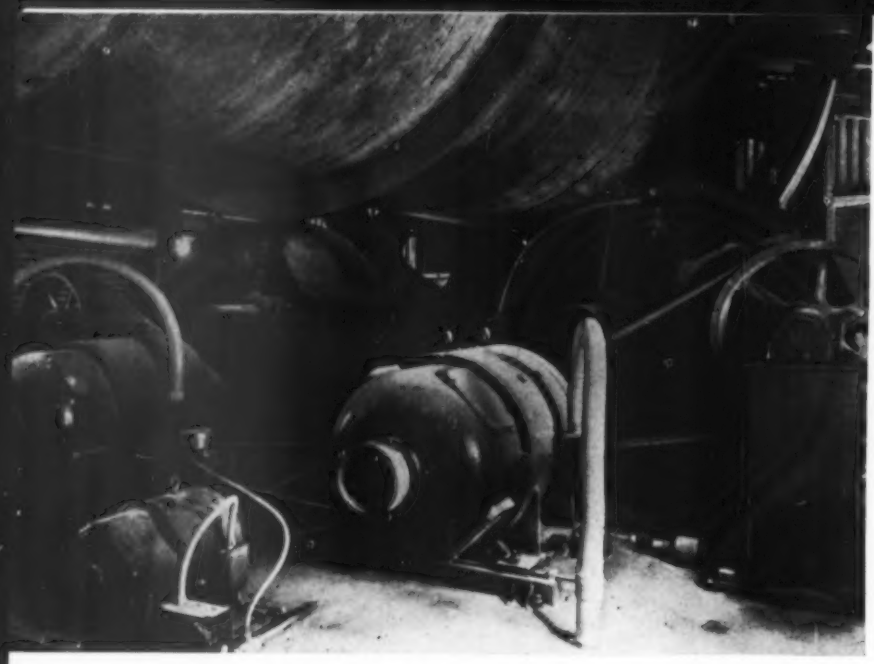


This kiln with a dual drive has a synchronous tie generator (foreground) for the slurry feeder.

What You Should Know about modern

By W. G. LEFFERTS
Allis-Chalmers Mfg. Co.
Processing Machinery Dept.

Part I

AS motors go, so goes the cement plant — its crushers, pumps, washmills, screens, conveyors, fans, kilns, and other vital units. Without motors, the idle plant quickly wastes man-hours and eats up profits.

Therefore, motors are important. And when motors are selected with purpose, a plant's electric power system becomes a positive factor to assure consistent operation of processing equipment, to lower investment and maintenance costs, and to reduce plant downtime.

Kiln Characteristics Because it is the heart of any cement plant, the rotary kiln drive should receive prime consideration.

The required daily output of product, the type of feed, and the fuel burned will determine the horsepower of the drive. This is calculated at the maximum kiln speed with a loaded area approaching 10 percent and a factor for friction loss based on experience. Depending upon the economics of the drive, overall reliability, and ease of maintenance, a single or dual drive is used. The usual dividing line between single and dual drives is about 200 hp.

A kiln drive should provide adjustable and steady speed; it must be reliable; and it should be easily maintained. Less important factors to be considered are first cost and efficiency, but too often these outweigh the others when designs and purchases are made.

Kiln drives have been called a "constant torque" application, but this is not quite true. In the first place, rings will form in a kiln and dam the material behind them, increasing the torque required. If the operator has to stop the kiln for any reason under these conditions, he may be unable to start the kiln again. This is a serious situation, due to the possibility of kiln warping and production loss.

Whatever type of drive motor and horsepower requirement is specified by the kiln manufacturer, it is very important that the motor have ample torque and thermal capacity when it is operating at low speeds. This is necessary not only because of ring formation but also because kiln friction, due to warpage and roughness of support rollers, may increase after years of production. No matter what drive is used, it should be adequate for the life of the kiln, which can be from 10 to 40 years.

When a hot kiln is stopped, due to a power or mechanical failure, a reliable method is required for slowly turning the kiln. Several schemes have been developed to do this, but the most economical and reliable seems to be an internal combustion

Modern electric motors constitute a beneficial factor in plant cost and equipment operation only when selected and applied with purpose.

cement plant drives

engine, usually gasoline. The engine is usually arranged to turn the main drive reducer through an auxiliary gear reducer and a jaw clutch which automatically disengages when the high-speed shaft of the main drive reducer turns faster than the output shaft of the auxiliary gear reducer. The engine should be attended, however, to prevent high-speed backspin in case of a stall, unless suitable brakes (or the equivalent) have been provided.

Because of the large number of pieces of equipment in a plant—conveyors, crushers, mills, pumps, etc. —which can be best driven electrically, the kiln drive is also electrical. And, due to requirements of burning temperature and retention time in the kiln, all modern kiln drives have adjustable speed. Since mechanical methods of speed control are usually too cumbersome for the larger kilns used today, the speed changing is usually accomplished electrically.

Kiln Drives Analyzed There are five common types of kiln drives: (1) constant potential d.c., (2) adjustable voltage d.c., (3) eddy current couplings, (4) fluid couplings, and (5) wound-rotor motors.

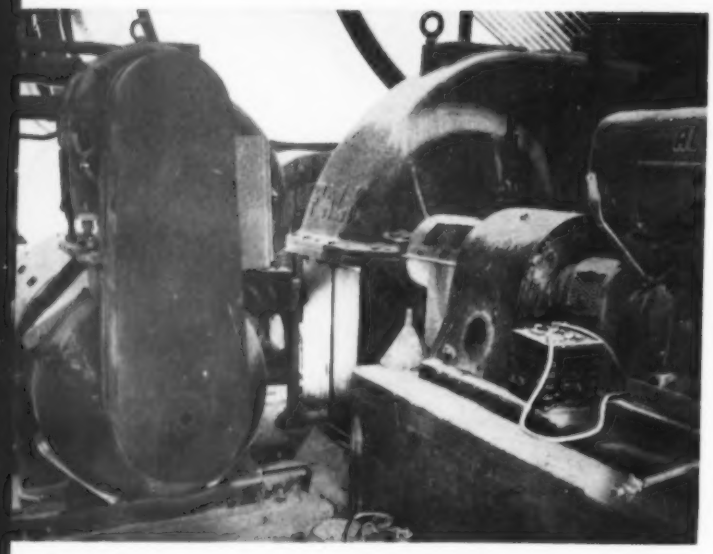
1. Constant potential d.c.—This

Components of Constant Potential D.C. System for Kiln Department

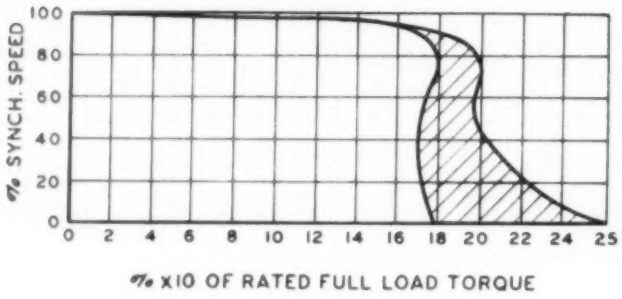
Kiln Drive—Motors
- Stabilized shunt or shunt-wound d.c. motors with:
  - 3:1 or 4:1 speed range by shunt field weakening
  - Taper-rated or constant-horsepower-rated
  - Drip-proof or better enclosures
  - Antifriction bearings
  - Ability to withstand approximately twice maximum speed on kiln roll-back if dynamic braking is not incorporated in the control.

Kiln Drive—Controllers
- Magnetic reduced-voltage-timed acceleration type required with:
  - Field loss relays
  - Economizing relays if dynamic braking is not included in control
  - Accelerating contractors (minimum, three steps)
  - Accelerating resistors
  - Timing relays
  - Necessary control relays
  - Manual speed rehostats for separate mounting for smaller kilns, motor-driven rheostats for very large kilns
  - Dynamic braking to prevent fast kiln roll-back
  - Field accelerating relays
  - Field decelerating relays
  - Dust-tight enclosures or clean location

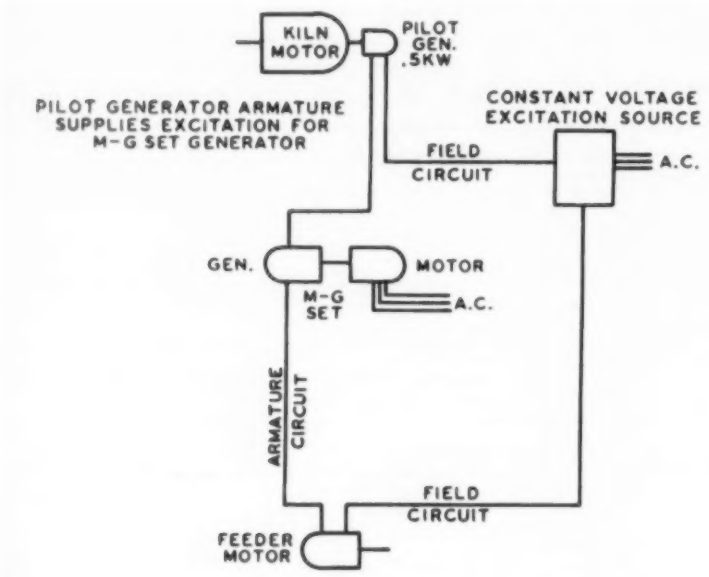
Kiln Drive—D.C. Supply
- Number and characteristics of generators or rectifiers to provide maximum reliability
- Flat compounded for voltage stability
- Ability to operate in parallel
- Comparatively clean location



This 100 hp. kiln drive motor has a top-mounted d.c. generator.



This graph shows the speed-torque curve of a four-speed squirrel-cage motor. The shaded area represents the limits of all four speeds.



Application of feeder tie in modernizing an existing installation is shown by this schematic drawing. No a.c. controls, d.c. controls, field rheostats or tachometric equipment are shown. To operate the feeder with the kiln at a standstill, the m.-g. set can be self-excited or can have its field supply transferred to the constant voltage excitation source.

system consists of adjustable-speed d.c. motors (shunt field weakening) with speed ranges of 3 to 1 or more driving the kiln, supported by one or more constant potential generators, rectifiers, or other d.c. source.

It is expensive where the number of adjustable-speed drives is small, but it becomes increasingly competitive with more drives. Because the motors used are essentially constant horsepower, they are larger than necessary for slow-speed operation; but the use of this system assures smooth and easy starts without commutator sparking, regardless of any ring formation in the kiln.

Each motor requires its own control, which for kilns requires the following: a means of automatic acceleration in steps; field loss relays because of possible damage to the motor commutator due to an open shunt field circuit; field economizing to prevent detrimental high voltage from being generated when the kiln rolls back under its load after stopping; and the necessary complement of relays, resistors, and contractors to accomplish motor protection.

Because of the necessity for field loss relays, due to possibility of the shunt field circuit being broken and because of the desire for control simplification, the motor fields remain excited even when the motor is idle. Field economizing can, therefore, be accomplished only to the point at which the field loss relay holds in. It follows that the economizing resistance cannot be much greater than the value of the shunt field rheostat. It will usually be necessary to reduce the rheostat resistance almost to zero before the field loss relay will pick up again after the motor has stopped. This generally is no detriment to operation because a kiln should be started at low speeds.

Let us consider the d.c. supply and its control. The old stand-by is the motor-generator set. This arrangement has proved reliable and maintainable by cement plant personnel. In order to facilitate maintenance and to attain the maximum continuity of supply required by a kiln, more than one m.-g. set should be paralleled to a d.c. bus. They should be sized for minimum and maximum requirements of d.c. for economical and maintenance rea-

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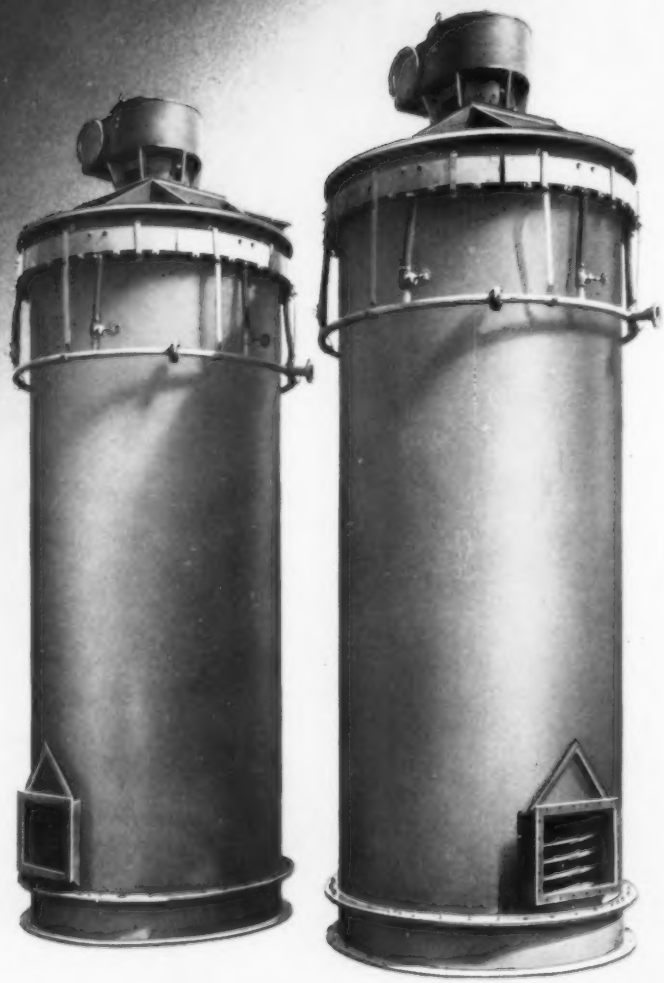

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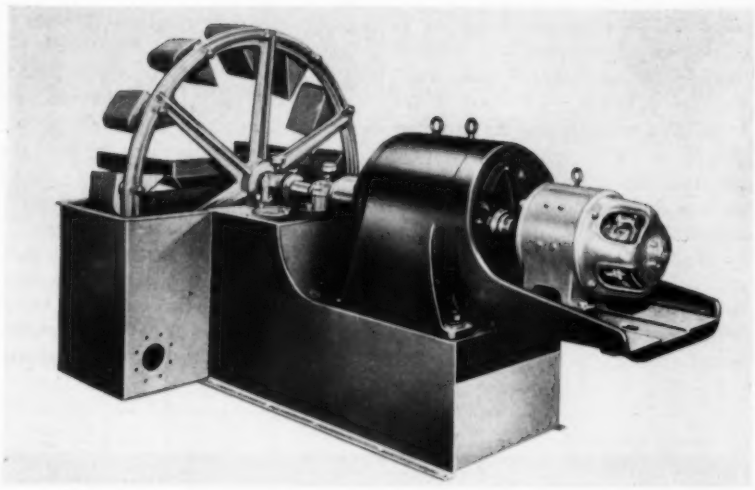
Bombay, India

sons. For instance, the minimum requirements for d.c. might be 100 kw., which would be the d.c. demand to operate at a reduced rate—perhaps half-capacity—while 200 kw. would be required for maximum output. If two 100-kw. generators were operated in parallel for full output, one generator could be shut down for maintenance without stopping the kiln department.

If the kiln can require 70 percent of the d.c. capacity, certain precautions are necessary in the d.c. controls. Assume that the d.c. generators are properly compounded to share the load under all demands. They should also either be flat-compounded or not more than 5 percent overcompounded. The fact that many paralleled generators do not share their loads satisfactorily does not relieve their manufacturers of the responsibility for proper operation.

When the kiln is rapidly accelerated or decelerated by adjustment of the field rheostat, heavy forward or reversed currents can be taken or generated by the kiln drive motor or motors due to the inertia of the kiln. To prevent heavy surges of this reverse or forward current, current-limiting relays must be incorporated in the kiln drive motor controls.

Two conditions exist under which these current surges can be tolerated: 1) when all d.c. is fed from a single m.-g. set; 2) when the kiln requires less than 70 percent of the d.c. demand. (The figure of 70 percent is an assumption and may not be representative of all cases.) In installations where these current surges cannot be tolerated, it is necessary to provide current-limiting relays in the control.



It is desirable for slurry feeders to have absolute tracking of the feeder speed with the kiln speed.

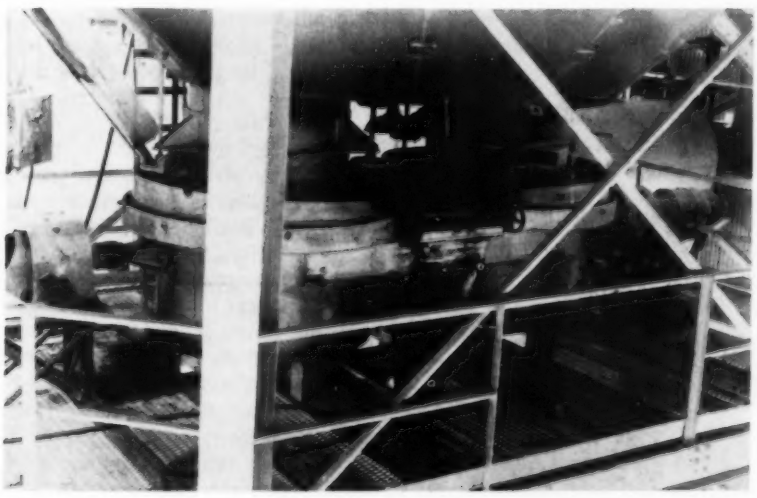
Whenever generator sets are operated in parallel, the following devices are needed: reverse-current, instantaneous, and thermal trips for three poles to the d.c. supply and equalizer buses. Reverse-current trips are required to prevent motoring of the generator and consequent depolarization, in case of a.c. power failure, instantaneous trips to prevent commutator damage, and thermal trips to prevent insulation and/or commutator damage due to high temperature.

Relays operating breaker shunt trips are usual, but a shunt trip is also required for another purpose—to open the d.c. breaker in case of a.c. power failure or momentary low a.c. voltage, which would cause one generator drive motor to drop off the line but leave another still operating.

2. **Adjustable voltage d.c.**—Considerable care must be exercised in choosing this type of drive. Attention must be given to the fact that peak starting and running torques will exceed the normal running torque.

It may be necessary to oversize the motors and generators or else select a motor with much lower base speed than the maximum operating speed. In the latter case, the motor should have maximum field strength when it is operating at the lower speed range. Excitation requirements must be fed from a constant voltage source, such as a compound-wound exciter or an electronically regulated rectifier. The adjustable-voltage source may be either a rotating generator or a magnetic amplifier controlling saturable reactors.

However, for the sizes usually encountered in kiln drives, it is usual to use a rotating generator with magnetic-amplifier-controlled adjustable excitation. This feature facilitates speed control from a remote location by manipulation of a small



Wound-rotor induction motors are frequently used with twin table feeders (twin 72-in. table feeder shown). For finer control, other adjustable-speed drives may be used.

rheostat. Likewise, it renders automatic control of speed less difficult than with a constant-potential field-weakening motor. It should be remembered in specifying these drives that it is necessary to provide some means of limiting the rates of acceleration to prevent damage to commutators from current surges.

In spite of these factors, however, the adjustable-voltage system has many advantages for kiln drives. When the speeds of two or more motors are to be fairly closely synchronized, they can be connected in parallel across the adjustable-voltage generator. When motor armatures are in series, however, the voltages across the armatures should be equal for proper operation of the combination.

A disadvantage of this system is the source of adjustable voltage.

A modern cement kiln department requires a number of adjustable-speed drives, some of which have independently adjustable speeds. Since each of these adjustable-speed drives must have an independent adjustable-voltage source, a kiln department using this method of speed control can be quite uneconomical.

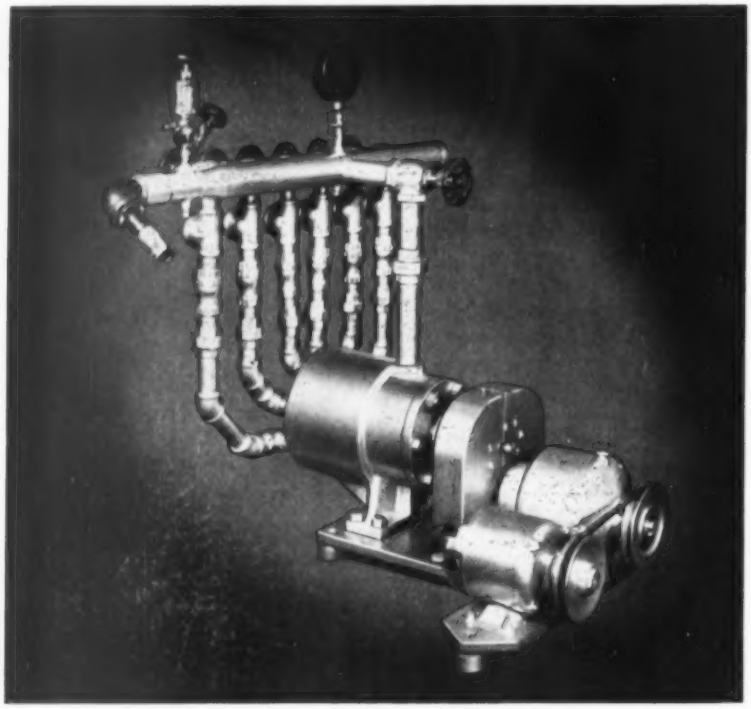
In addition, two prime requisites of a kiln department—reliability and ease of maintenance—may be seriously impaired. When several motors are furnished with power from a multiple generator source, the possibility of failure is less than if one motor is supplied from a single source. Therefore, a properly designed constant-voltage system should be more reliable than a group of adjustable-voltage systems. Maintenance personnel are also more familiar with motors, generators, and contactors than with magnetic ampliers and rectifiers, a fact tending to make a constant-voltage system easier to maintain.

3. **Eddy-current couplings** — These couplings are variable-speed devices having a speed output that is electronically stabilized.

If only kiln drives are considered (or at most, kilns and feeders), the eddy-current coupling is quite versatile and economical in first cost. However, it is rather inefficient electrically at speeds below 80 percent maximum. In addition to this disadvantage, special precautions must be taken in the design of the driven member to prevent damage on kiln roll-back due to overspeed. Dynamic braking can be accomplished by braking and holding the cage rotor of the motor before roll-back occurs, or by using coupling-brake combinations.

Eddy-current couplings are readily operable in pairs for dual drives in sizes suitable for kilns. They can be water-cooled or air-cooled. Overhung loads tend to present problems in belted drives, and direct-coupling to gear reducers tends to lessen flexibility in comparison to motor drives through V-belts to reducers. Comments previously made with respect to maintenance of electronic power supply (that is, lack of familiarity on the part of personnel) also apply to these drives.

Both couplings and motors must be adequately sized to supply the maximum peak torque required by the kiln under any operating conditions. There is a tendency on the part of coupling manufacturers to



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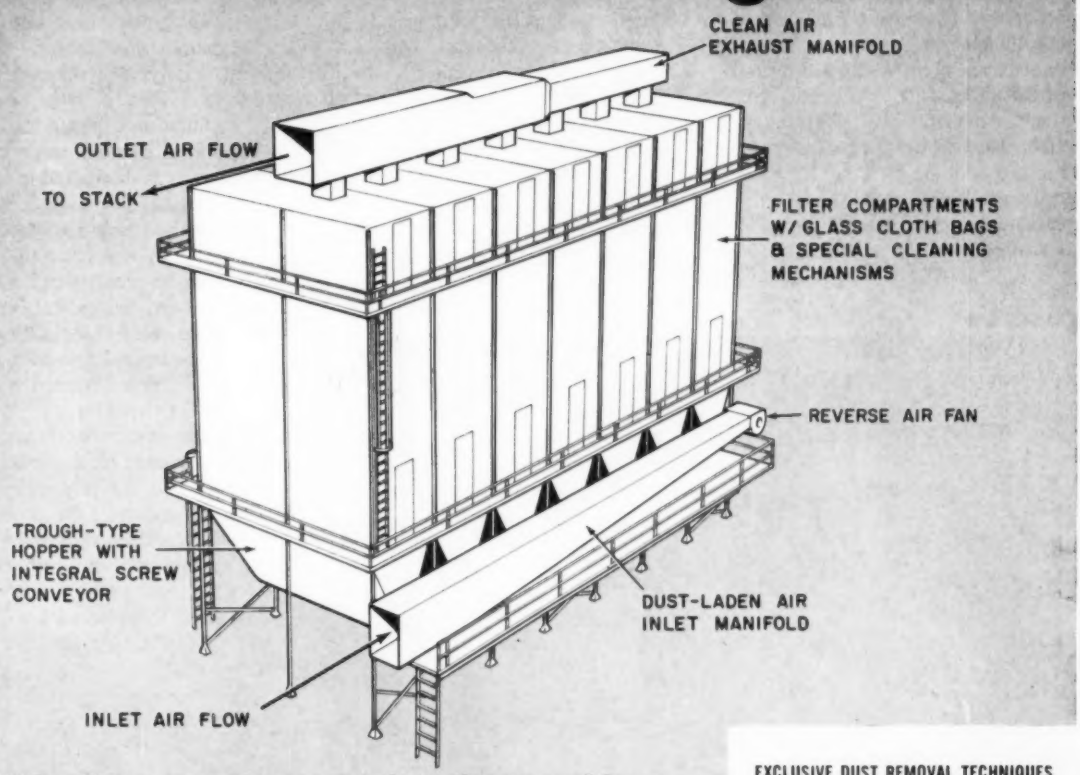

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overlook the requirement for abnormally large torques at low speeds for comparatively long periods. Recent operating reports indicate that air-cooled couplings with magnetic-amplifier control are remarkably reliable and maintenance-free in sizes up to about 150 hp. Speed stability seems excellent.

4. **Fluid couplings**—Remarks made about eddy-current couplings generally apply to fluid couplings, except that fluid must be cooled as losses are transferred to the fluid as heat, and remote control is not as efficient. Constant speed of the kiln cannot be held to prevent minor, instantaneous changes in speed with small changes in load. Electronic proportioning controls with reset are necessary to hold an average constant speed similar to that obtained with eddy-current couplings.

Instant starting and stopping of this type of drive cannot be achieved, because fluid cannot be pumped into or emptied from the impellers instantaneously. Some time lag will always exist in the control of this coupling.

5. **Wound-rotor motors**—The oldest, cheapest, and probably still most frequently used kiln drive is the wound-rotor motor. On large kilns, this type of drive is not very suitable. This is true because of the installation expense involved and its poor efficiency, since considerable power is dissipated in its speed-regulating resistors. Recently, however, a dual drive of two 75-hp. motors has been installed.

Adequate controls for wound-rotor motor drives are expensive, and since normal operating speeds will range from 80 to 90 percent of maximum, much wasted power will result. On these large drives, speed regulation is remote from a push-button station, as secondary resistance should be physically located near the motors. Otherwise, large secondary cables must be run from the motors to the drum controller at the burner panel.

Wound rotor motors will seldom start on the first starting resistor steps, but on a lower resistance step. After starting, the rotor resistance is increased to provide the lowest speed ranges. Speed regulation is very difficult at low speeds; ranges greater than 2 to 1 should not be used.

Brush shifting a.c. motors—This is still the most popular motor in modern European cement plants and has been used occasionally in this country. A motor quite similar to this is now made in this country with stationary brushes and with speed regulation controlled by an induction regulator. The induction regulator becomes quite large for the larger motors (above 100 hp.) and should be pilot-motor operated to eliminate the expense of large cable runs.

The efficiency of this motor is about 80 percent, and commutation is reportedly good. In general, these motors should be somewhat oversized to handle the kiln adequately under all unusual conditions of operation. Speed regulation with variations from no load to full load is about 5 percent.

Motors of this type are about the same price as four-speed induction motors, but have a much more

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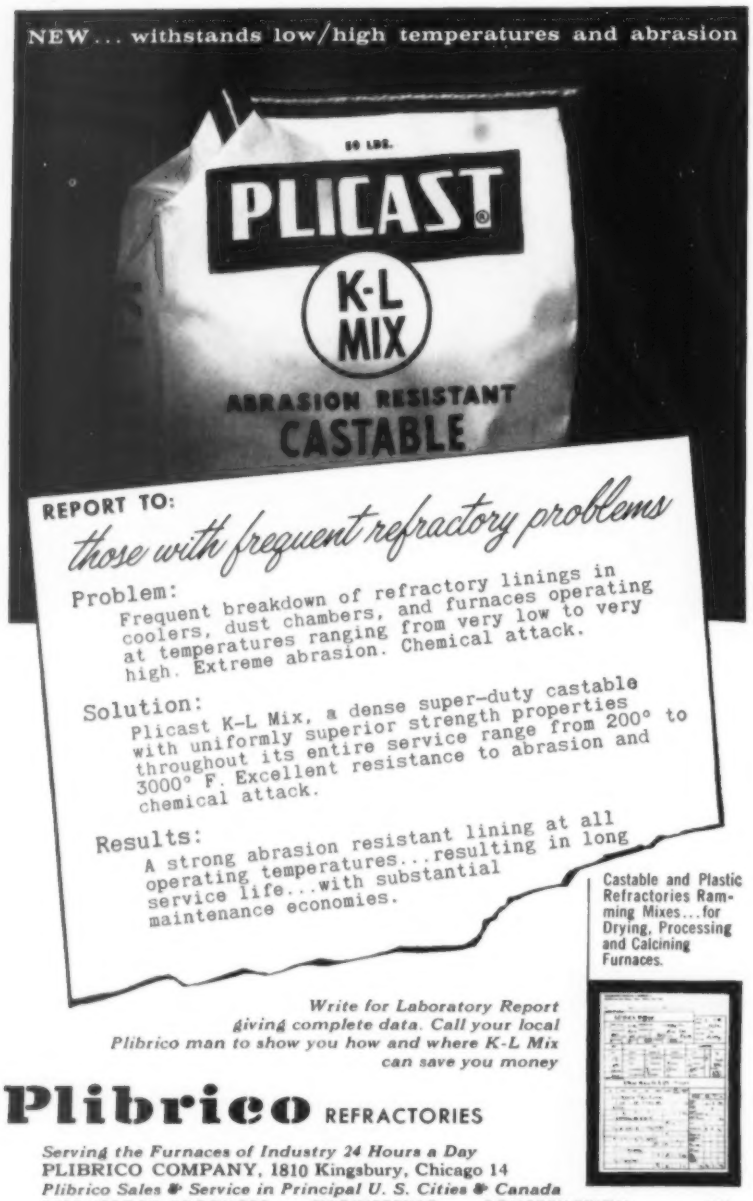
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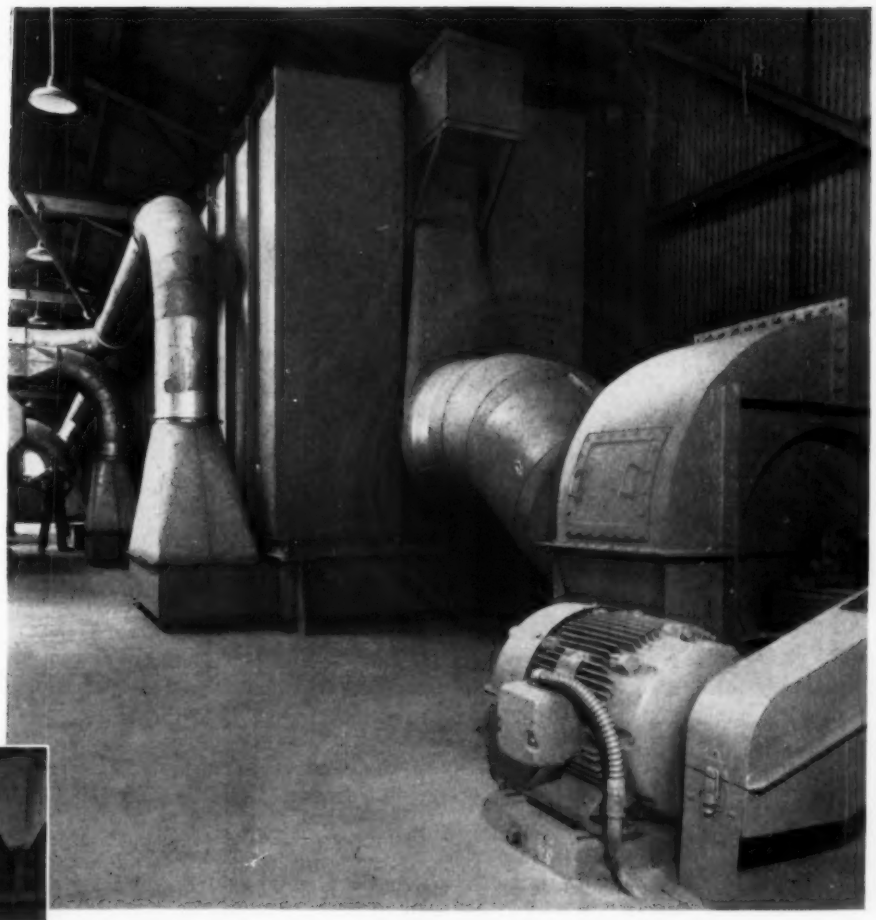

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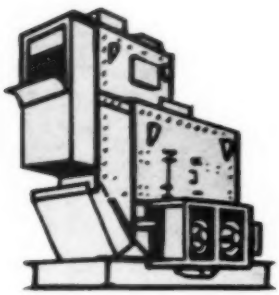

2—36" x 48" Senior Cubers—in the crushing building.

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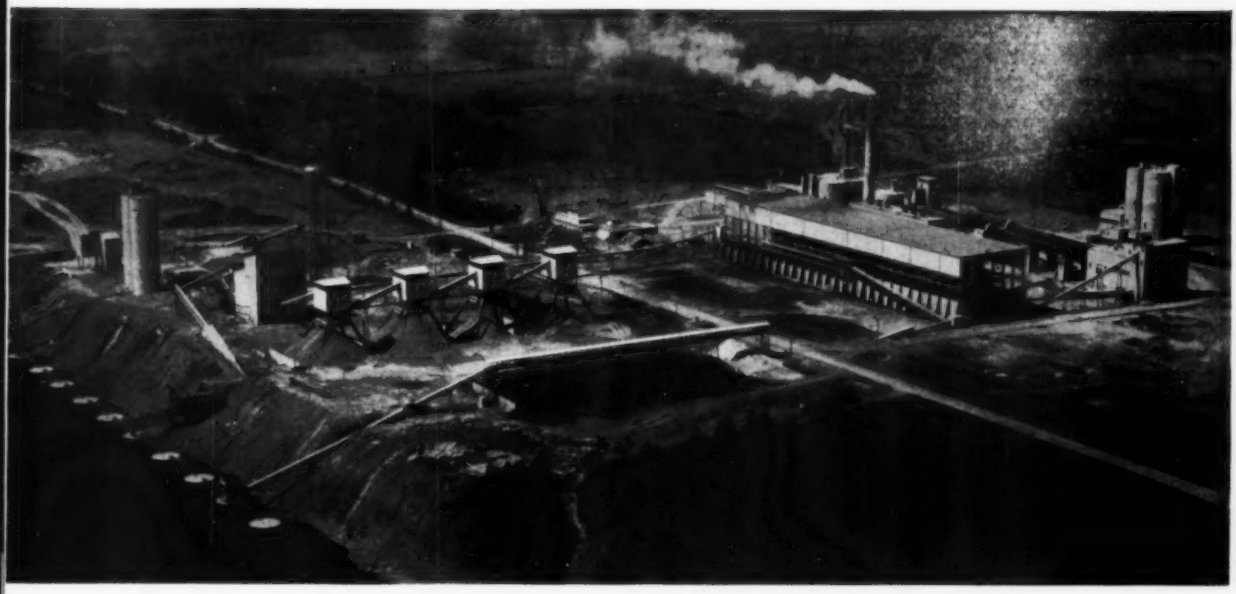

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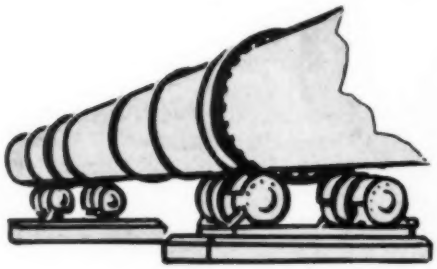
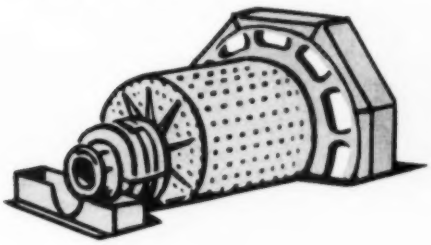
1—10′ x 50′ Clay Dryer.
2—10′ x 375′ Dry Process Cement Kilns.



KENNEDY Ball Mills

1—11′ x 20′ 2-compartment Raw Mill.
1—11′ x 20′ 2-compartment Raw/Finish Mill.
2—11′ x 20′ 2-compartment Finish Mills.



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Cement Plant Drives

(*From page* 176)

closely adjustable speed range. In fact, speed adjustment is continuous. High locked-rotor and accelerating torques should always be incorporated in these motors. Care must also be exercised to prevent damage to these motors by overspeed on kiln roll-back. Brush maintenance is somewhat higher than that required for a d.c. motor. Forced ventilation with clean air may also be desirable.

Four-speed squirrel-cage motors—Although the two winding, consequent pole, constant torque, four-speed cage motor is very popular for calcining kilns, it is not very suitable for cement kilns. Normal operation should coincide with next-to-the-highest speed; and because the speeds differ so much, proper cement burning becomes difficult. These drives are limited to about 150 hp. as dual drives will not divide their loads properly due to the span of commercially suitable manufacturing tolerances.

These motors should have the equivalent of NEMA Design "C" rotor construction. In order to prevent damage to the bearing surfaces of the kiln support rollers it is recommended that compelling relays be provided on the controls for the larger kilns, to enforce starting at the lowest speed. The following speed-torque curve is more or less typical of these motors.

Enclosures—Nearly all cement kiln drive motors are of drip-proof, drip-proof fully protected, or splash-proof construction with antifriction bearings for mounting on a slope of about ½ in. per ft. More elaborate enclosures are usually unnecessary because there is ordinarily not much dust at the kiln drive.

In those unprotected installations where either dusty atmosphere or driving rains can cause trouble, more elaborate enclosures are required. If cage motors are used, open motors with the new silicone-rubber or epoxy-resin insulations may be preferred. As an ultimate, these drives could be totally enclosed for forced-air cooling or for some form of heat-exchanging equipment built directly on the motor.

Kiln drive motors are usually subjected to high ambient temperatures, particularly during warm weather. Heat-reflecting shields between the kiln and its drive motor will be effective in reducing the motor temperature; and if they are properly designed, they can also provide protection from rain.

Trends in Kiln Feeder Drives

Two characteristics of feeder drives are desirable: (1) that the feeder may be run independently of the kiln for starting and maintenance; and (2) that the feed rate may be changed independently of kiln speed to compensate for chemical changes in the feed.

Two types of kiln feeders are in common use: a slurry feeder, and a screw feeder (for a dry feed or filter cake). In the former, starting or locked-rotor torques are less than 100 percent of the motor torque rating corresponding to full-load speed. For the latter, however, the equivalent of 200 percent, locked-rotor

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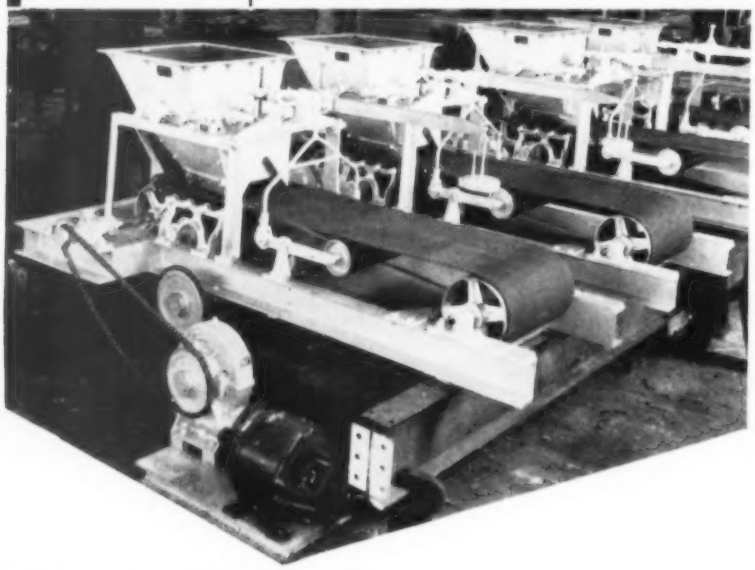

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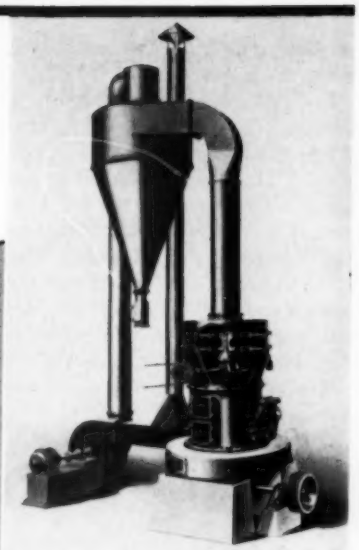

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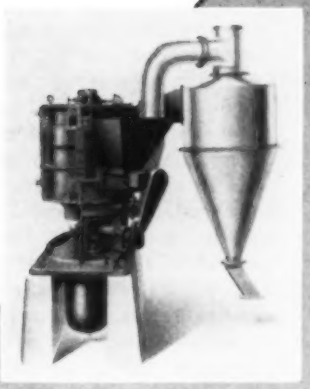

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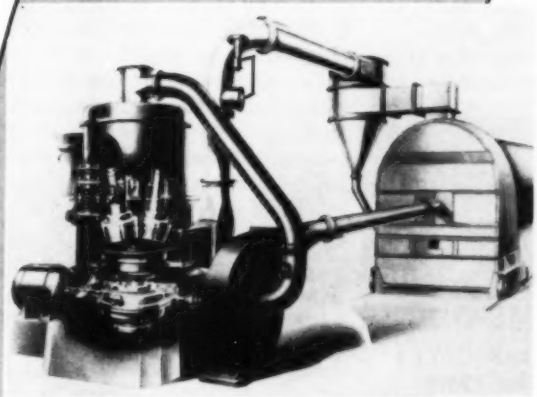

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WHEN you have an individual problem, you naturally go to a specialist . . . and in the same way . . . whatever your grinding requirements may be, you can serve your own interests best by placing your problem in the hands of Raymond engineering specialists with over a half-century of experience in the design and manufacture of pulverizing and separating machinery.

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torque should be provided in the motor driving the screw.

In addition to the above, it is desirable to have absolute tracking of the feeder speed with the kiln speed. This desirable result is obtainable with synchronous machines such as power selsyns or synchronous alternators and synchronous-induction motors. The selsyn does not possess some of the other desirable features of the feeder-tie arrangement, but the alternator-synchronous-induction motor type provides all the desirable characteristics except that of changing the ratio between kiln speed and feeder speed. The ratio must be controlled by gear-shifting transmission, flow deflector plates, or some other mechanical arrangement; and it is necessary to bear in mind that gears, chains, or timing belts are necessary if absolute tracking accuracy is desired. Feeder tracking accuracies of 1 to 5 percent are common; but for better than 1 percent, observe the above precautions.

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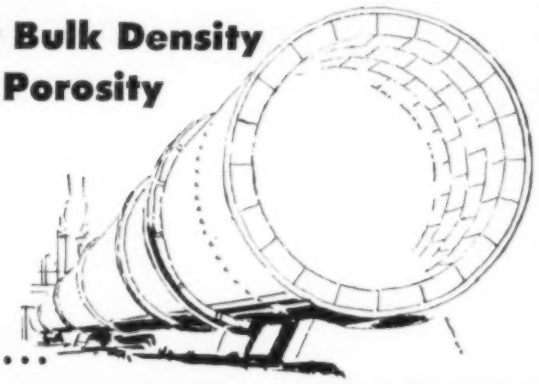

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1. **Adjustable-Voltage Feeder Drive**—This type of feeder drive will not result in absolutely accurate speed tracking between kiln and feeder, but it does provide simple and inexpensive remote control of the speed ratio between kiln and feeder by a field rheostat. This drive has the required flexibility mentioned previously.

A variation of this feeder drive has been employed in constant potential systems in which the kiln drive motor turns a variable-speed generator large enough to furnish power at variable voltage to a feeder drive motor. For maintenance or independent operation of the feeder, the feeder motor is fed from the d.c. bus. This type of feeder drive, as well as the "synchronous-tie" type described later, is adaptable to any kind of kiln drive, provided that the additional power is available from the kiln drive motor.

If the kiln drive motor is already overloaded, a variation of this drive can be employed; in this drive only the excitation is supplied by a very small d.c. generator for the field of another d.c. generator on an m.-g. set which, in turn, supplies power to the feeder. This latter case is applicable if a feeder tie is required in modernizing an existing kiln installation as shown on page 170.

2. **"Synchronous-tie" feeder drive**—This type of power selsyn drive has been in use for many years. It consists of a variable-speed alternator driven by the kiln drive motor. The alternator supplies a squirrel-cage motor driving the feeder. This system uses standard electrical equipment and conforms to requirements for maintenance and independent operation of the feeder.

Synchronous-tie feeder drives require a mechanical method of changing the ratio between kiln speed and feeder speed; and in that respect it lacks the flexibility inherent in the adjustable-voltage feeder drive.

However, the worst fault of the old synchronous-tie is that the kiln-feeder speed ratio is not constant over the entire speed range of operation, because the slip of the cage induction motor is not a constant percentage regardless of frequency. If, instead of a cage motor driving the feeder, a synchronous-induction motor is substituted, no error due

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36-ft. body shown.
125 Barrel Capacity.
Weight 12,140 lbs.

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DELIVER UP TO 100′ ELEVATIONS by choosing AIR-MECHANICAL

Efficient pneumatic system elevates cement up to 100′ high at a rate of ¾ ton per minute. Discharge rate of other commodities vary according to density.

BAUGHMAN PATENTED AIR-CELL ASSURES UNIFORM FLOW

Exclusive air-cell promotes uniform flow . . . without "slugging" . . . by "fluidizing" materials. Handy fingertip control varies speed of flow.

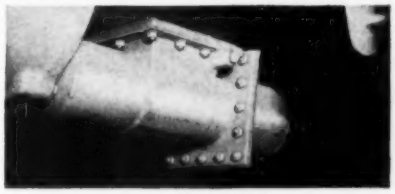
NO CONDENSATION MEANS MORE PAYLOAD CAPACITY

SST-11P Tank is unpressurized. No forming of solidified materials due to inherent moisture carried through air system or condensation as in pressurized tanks. In the Baughman Multi-Purpose Transport, materials enter DRY through the air flow at the air-lock, assuring a lighter-weight unit with more payload capacity.

DELIVER TO PIT OR CONVEYOR by choosing STRAIGHT MECHANICAL!

High rate discharge for unloading materials into ground-level bins about one ton per minute.

Body auger is split . . . for unloading rear half and front half of body in sequence, thus relieving drive mechanism of heavy starting load.



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Baughman-designed, automatic swing gate check valve prevents material in discharge system from flowing back into air pump in event power unit is stopped for any reason. Automatically opens on pressure rise from blower. Equipped with external lever for testing valve function.

POWER UNIT

Auxiliary engine with ample reserve capacity directly connected to high volume, positive displacement lobe type blower. Deliver a fixed volume of clean, dry air with constant volume. Lighter weight — more payload. Equipped with silencer filter.

Lightweight, simple two-speed drive for unloading body pneumatically and high-speed mechanical discharge for unloading on conveyors or into pits.

Split-drive — for unloading rear half and front half of body consecutively.

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Units are custom-built . . . height, weight, length and capacity. Body is fabricated of heavy 13 gauge steel, rigidly reinforced with box-type jacks and internal perforated bulk heads. Also available in aluminum. 24" diameter water-tight loading hatches and Baughman patented air-cell over 9" screw. Body lengths 10′ to 40′. Available with round top.

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to slip is introduced, and absolute tracking accuracy results.

To take full advantage of the synchronous-induction motor tracking accuracy, all machines should be direct-connected, geared or timing-belted, as V-belts do not provide absolutely constant ratios. When the synchronous-tie system with synchronous-induction motor is used with a screw feeder, an oversize motor should be used on the feeder to assure 200 percent locked-rotor torques. The next larger size of motor rating should prove adequate.

Many other types of feeder drives have been devised, but the simpler and most easily maintained types are those without electronic components and are the only ones considered in great detail here. Electronic speed-ratio controllers, although in use, should properly be classed under automation.

3. **Other feeders**—Other types of feeders are also used in cement plants for continuous proportioning of materials to mills or dryers, coal feeding, gypsum to clinker, etc.

Vane feeders for dry material require motors with 200 percent or more starting torques, and many have shear pins to prevent damage in the event they try to pass foreign material. These feeders may have adjustable-speed drives if used for variable proportioning and constant-speed drives under other conditions. Drives usually range from ½ to 2 hp. If used indoors, drip-proof motors are satisfactory. Inertia is less than normal. Some coal mills use this feeder.

Table feeders are also used for handling dry materials. There are two methods of changing the rate of flow over these, and they may be used simultaneously.

Adjustments of the rake above the table will give coarse control of the feed rate, and variable motor speed can provide fine control. The torque requirement is constant for any given rake position, but proper allowance must be made for starting and acceleration. Wound-rotor induction motors are frequently used; they work satisfactorily if the speed range is not over 2:1. For finer control, other adjustable-speed drives may be used. When damp material is fed, drip-proof enclosures for the motor are satisfactory; but with dry material, totally-enclosed motors should be used, as the motors are below the feeder and can be in very dusty places. Horsepowers can vary from 3 to 15 hp.

Pumps can be used for feeders in handling slurry or high-moisture cake. NEMA Design B motors with drip-proof enclosures are usually used for pumps and seem to perform satisfactorily. Horsepowers can vary from 5 to 50 hp.

Various manufacturers sell *weighing-belt* types of feeders, many of which are now using eddy-current couplings for adjustable-speed drives on the belts. Just as with kiln drives, continuity of service is the most important criterion.

In connection with all types of drives for adjustable-speed devices, it should be mentioned that mechanical speed-changers are available and have been used for all machines except those requiring large horsepowers.

(Part II will appear in August.)

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THE NEW

PORTLAND CEMENT PLANT MAP

Limited quantities of Pit and Quarry's new Portland Cement Plant Map are still available.

It is 34 inches high by 40 inches wide and printed on sturdy 60 pound stock, making it ideal for hanging on an office wall or placing under the glass top of your desk. Each producing plant is listed alphabetically, by state and city. This list covers the plants in the United States, Canada, Mexico, Cuba and Puerto Rico. These plants are also indicated on the geographical map. Also included in the information on each plant is the plant's producing capacity at the end of 1957, and its estimated capacity at the end of 1958, if the plant was planning to expand; the process used to manufacture each plant's cement . . . wet or dry; and the brand names of the cement each plant produces. New plants under construction and grinding plants also appear in this group.

In addition, portland cement distributing plants located in the United States, Canada, Mexico, Cuba and Puerto Rico appear in a separate list and are also shown on the geographical map.

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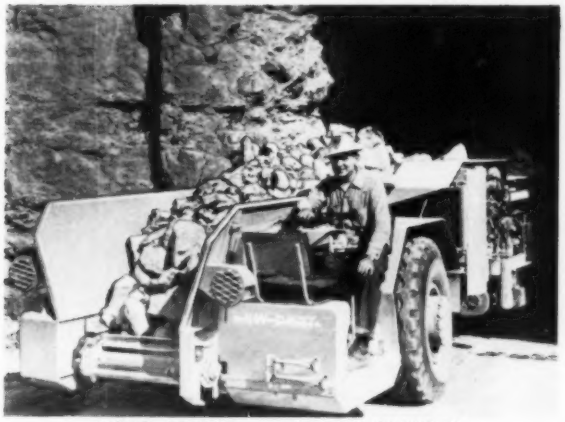

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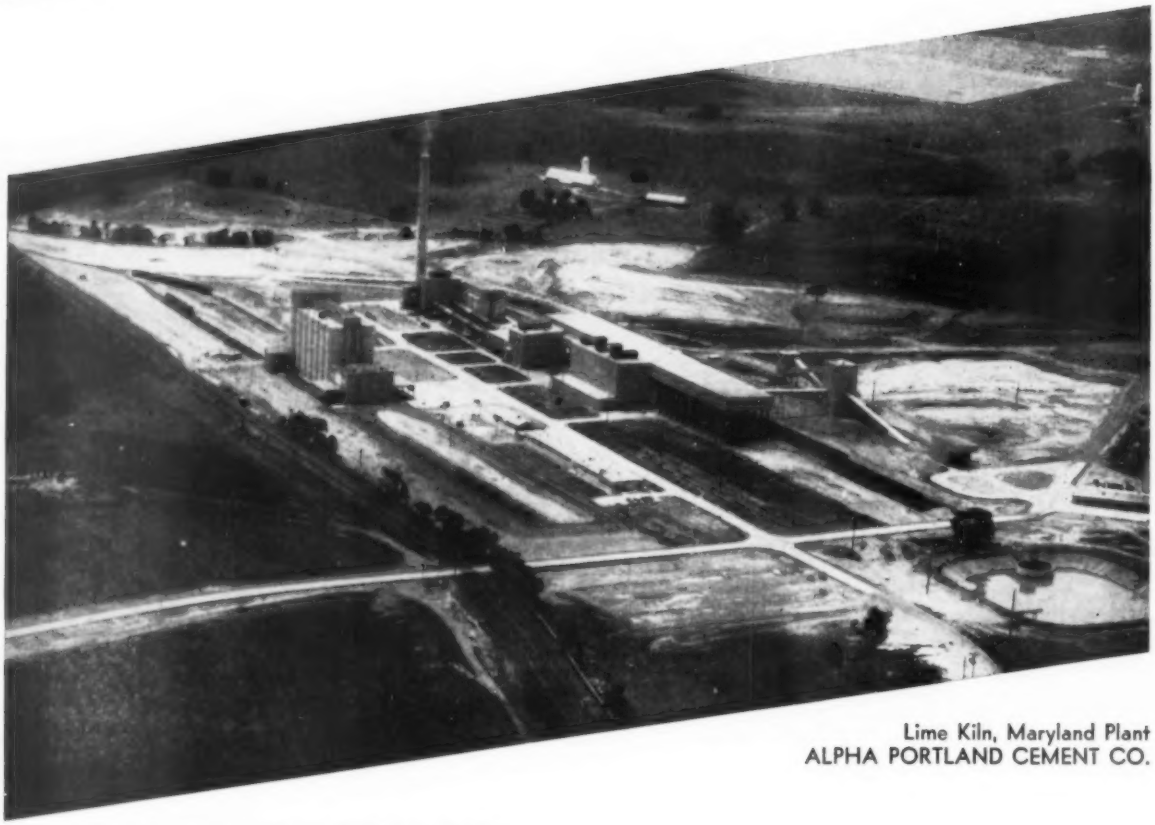

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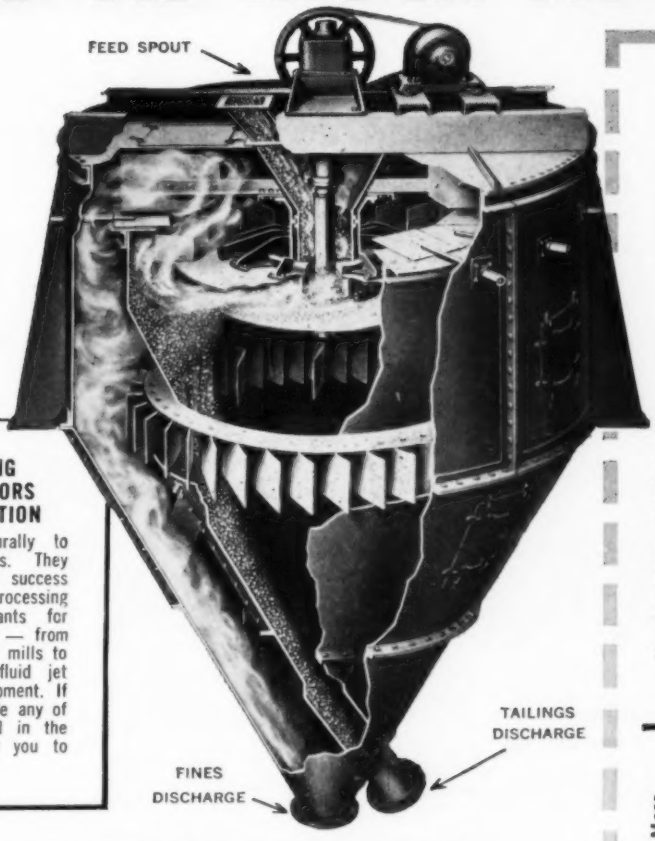

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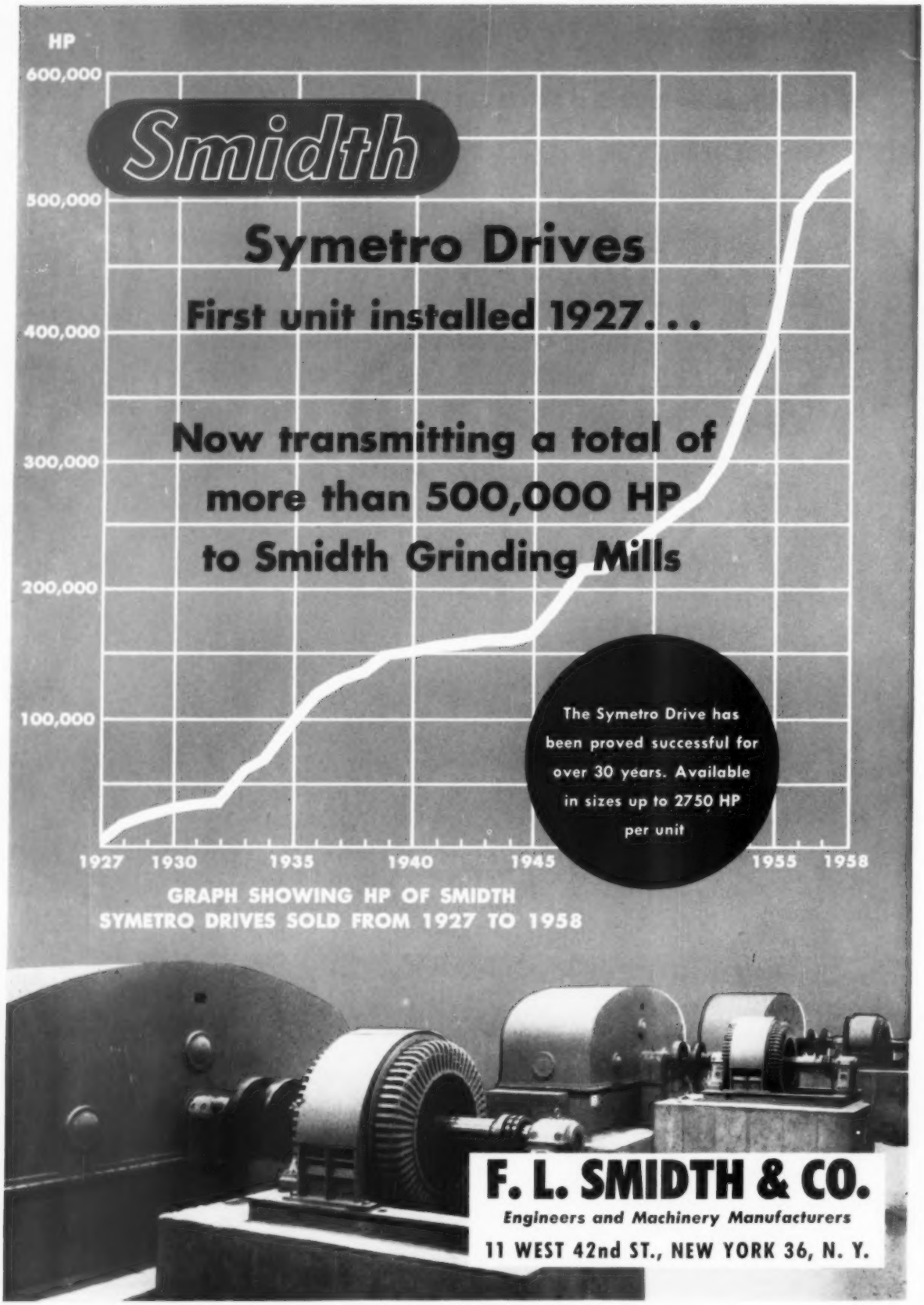

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The Symetro Drive has been proved successful for over 30 years. Available in sizes up to 2750 HP per unit

GRAPH SHOWING HP OF SMIDTH SYMETRO DRIVES SOLD FROM 1927 TO 1958

F. L. SMIDTH & CO.

Engineers and Machinery Manufacturers

11 WEST 42nd ST., NEW YORK 36, N. Y.

Enter 190 on card, page 255

STEARNS-ROGER BUILT

for

THOUSANDS OF BARRELS OF CLINKER

Two cement kilns each ten feet in diameter by four hundred feet long represent but one step in Stearns-Roger's complete service for design, engineering, fabrication and construction of cement plants. Call on the skill of qualified engineers working from long experience. For a smooth running plant, give the assignment to Stearns-Roger.

Stearns-Roger

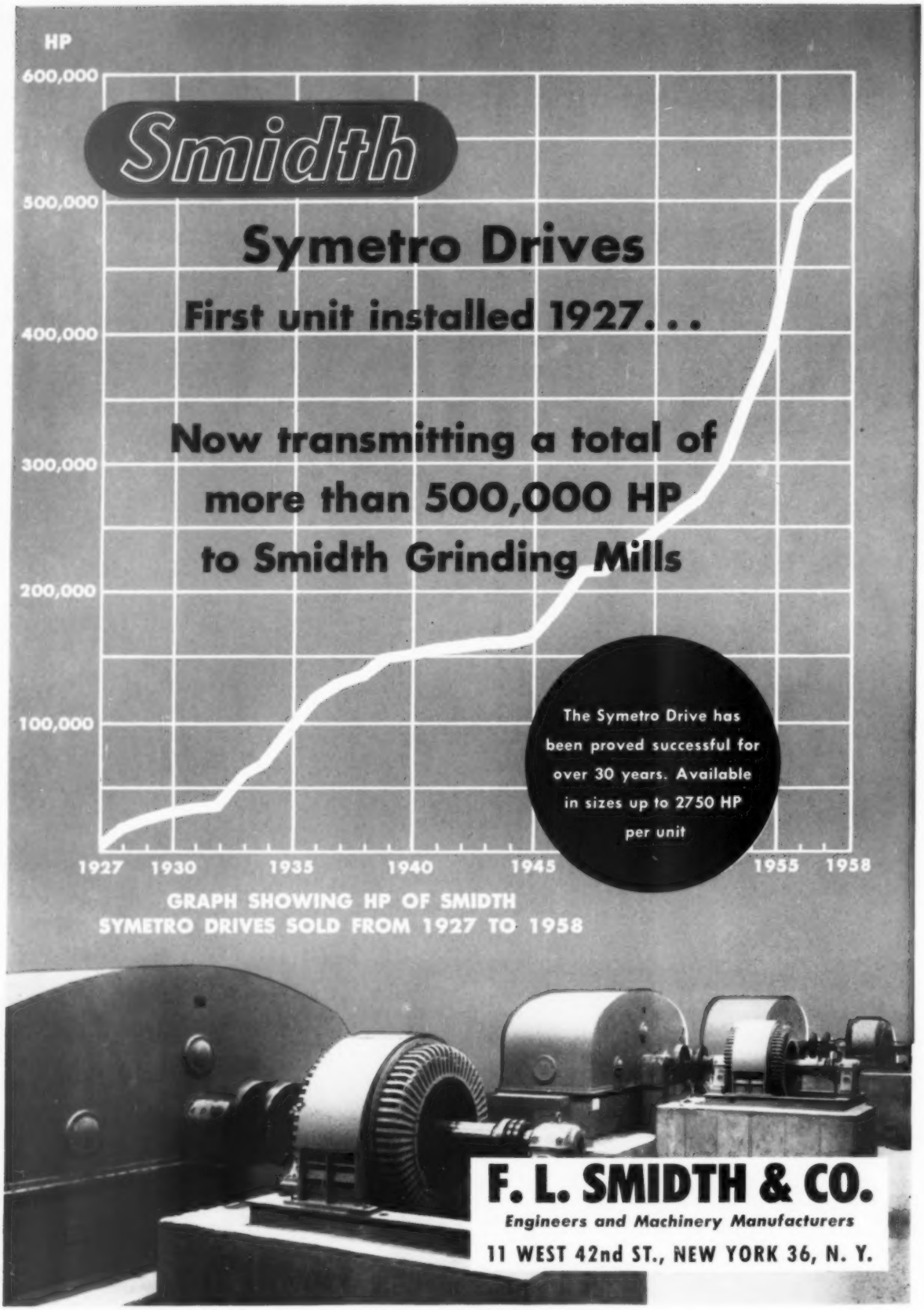
THE STEARNS-ROGER MFG. CO. · DENVER, COLORADO

Design, Engineering, Fabrication, Procurement, Construction

DENVER, HOUSTON, EL PASO, SALT LAKE CITY

STEARNS-ROGER ENGINEERING COMPANY, LTD., CALGARY

Enter 189 on card, page 255



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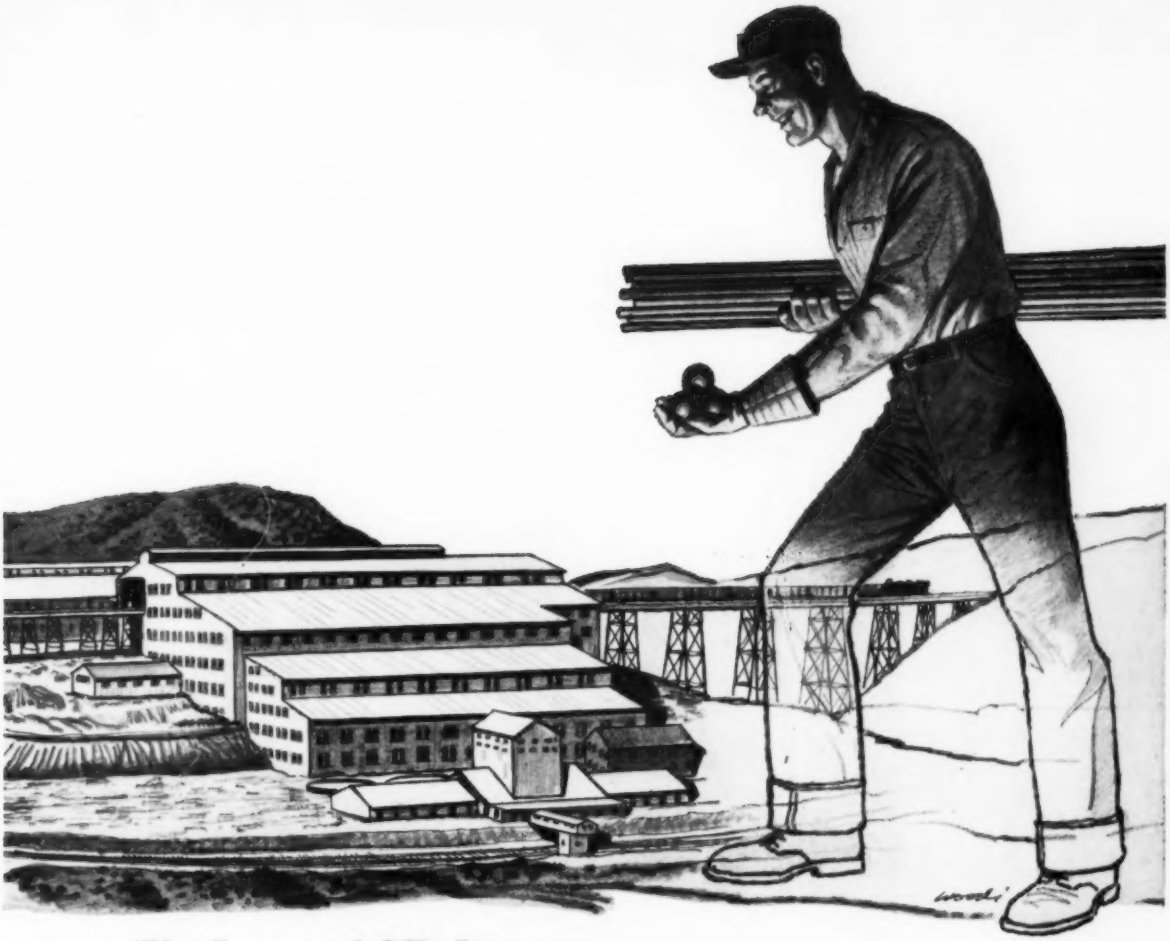


The Image of CF&I assures

quality steel Mining Products

This Image—the CF&I giant—stands for hundreds of dependable steel products used by many industries. And the CF&I name is prominent in the mining industry for such top-grade products as grinding balls and grinding rods.

For instance, the special analysis, hot-forged steel used in CF&I Grinding Balls gives uniform wearing qualities... high impact and abrasion resistance... maximum grinding efficiency.

CF&I Grinding Rods are hot-rolled from steel of special analysis, determined through years of experience to provide a hardness for high wear resistance, yet with a toughness to exclude bending or premature breakage. All rods are machine-straightened and their ends cut square so that they will freely rotate in the rod mill for better grinding.

We suggest you contact the nearest CF&I sales representative. He'll be glad to discuss your grinding problems with you, or give you complete information on all CF&I Mining Products.

OTHER CF&I STEEL PRODUCTS FOR THE CEMENT INDUSTRY

CF&I Grader Blades • CF&I Industrial Screens • CF&I Mine Rail and Accessories
CF&I-Wickwire Rope • CF&I Rock Bolts and Realock Metallic Fabric

CF&I STEEL

MINING PRODUCTS

THE COLORADO FUEL AND IRON CORPORATION

In the West: **THE COLORADO FUEL AND IRON CORPORATION**—Albuquerque · Amarillo · Billings · Boise · Butte · Denver · El Paso · Farmington · Ft. Worth · Houston · Kansas City · Lincoln · Los Angeles · Oakland · Oklahoma City · Phoenix · Portland · Pueblo · Salt Lake City · San Francisco · San Leandro · Seattle · Spokane · Wichita

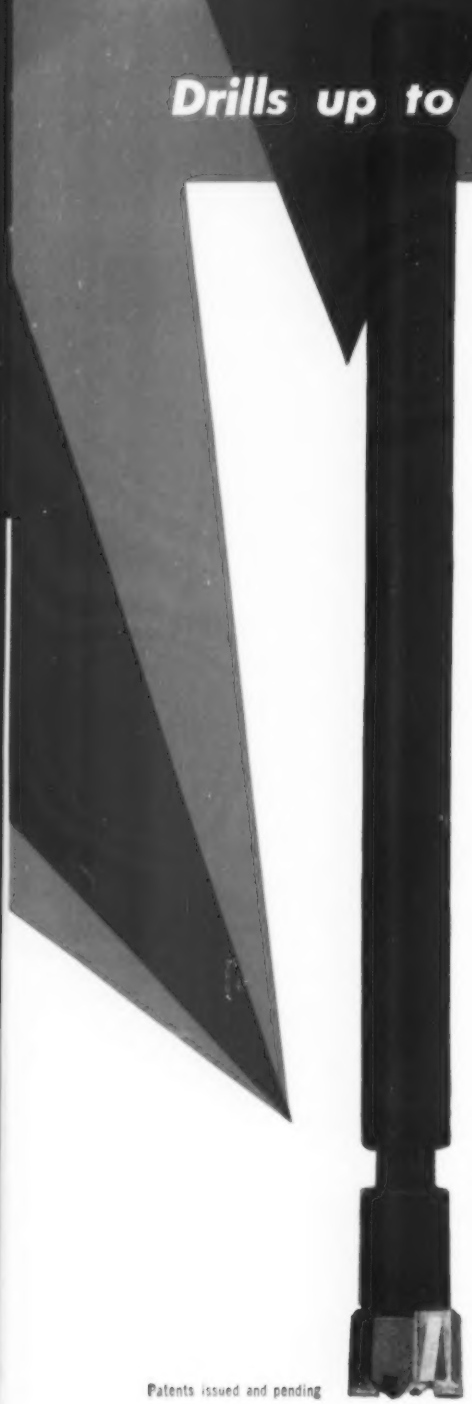
In the East: **WICKWIRE SPENCER STEEL DIVISION**—Atlanta · Boston · Buffalo · Chicago · Detroit · New Orleans · New York · Philadelphia 6625-A

Drills up to 30 feet an hour in granite

MISSION HAMMERDRIL

Trade Mark

Bottom Hole Impact Tool



Patents issued and pending

The Mission HAMMERBIT

Here's the economical answer to high speed drilling in hard rock. The HAMMERDRIL® is economical because of its design—only two moving parts in the high pressure tool, and only three moving parts in the low pressure tool. Economical because impact parts are heat-treated high alloy steel, moving parts are friction and wear resistant. Economical because you can use it on your present rotary rig with suitable air compressor capacity. Mission HAMMERBITS® feature massive tungsten carbide inserts which can be *resharpened in the field.* The HAMMERDRIL with the HAMMERBIT cuts the cost per foot of drilling every foot through hard rock.

The Mission HAMMERDRIL is sold and serviced throughout the United States. Write to Mission for more information on what the HAMMERDRIL can save you—actual field savings under field conditions.

Nothing but the finest will bear the name of MISSION MANUFACTURING CO

Serving the Petroleum Industry for Over Thirty Years

59-500

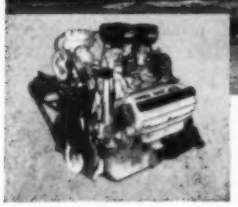
MISSION MANUFACTURING CO., P. O. Box 4209, Houston, Texas • Cable Address—"Missco" • Export Office: 30 Rockefeller Plaza, New York
In The United Kingdom: MISSION MANUFACTURING CO., LTD., 17 Hanover Square, London W. 1 England • Cable Address—"Missoman"
Pistons • Piston Rods • Slips • Gland Packings • Liners • Liner Packing • Pump Valves and Seats • Swabs • Valves • Hammerdrils • Centrifugal Pumps

Knuckles right down to any job!

This rugged heavyweight asks no quarter, it just wades right in and polishes off tough hauling jobs. Two high-capacity "live" rear axles give it better flotation and traction on soft ground. And its 234-hp. engine, with dual carburetors standard, gives this T900 tractor the big-chested power to handle the big hauling jobs without tiring.

The new Dodge tandems are packed with features that make heavy-duty hauling easier and more profitable: New instrument clusters, with tachometer and graduated ammeter and oil pressure gauges standard . . . suspended brake and clutch pedals . . . 90-degree-opening hood for easy servicing . . . air brakes standard on T900 models . . . up to 20 speeds forward. But see your Dodge dealer—and get the *heavy-duty* reasons why . . .

today,
it's real smart
to choose **Dodge Trucks**



Built throughout for dependable heavy-duty service, this 354-cubic-inch V-8 has dome-shaped combustion chambers . . . double rocker-arm shafts . . . precision timing gears instead of chains . . . positive exhaust-valve rotators . . . hydraulic tappets . . . sodium-cooled exhaust valves. And it develops full power on thrifty *regular* gas!

← Enter 192 on card, page 255

FOR THE JET AGE... LONGER RUNWAYS AND VINSOL PLAYS ITS PART

Vinsol resin has long been recognized as the most economical air-entraining material.

Today, with a record billion dollars to be spent this year alone on new and enlarged military, municipal, and private airports . . . with highway construction proceeding at an accelerated pace . . . with new construction of office buildings changing the skyline of our major cities—the efficiency and economy of Vinsol as an air-entraining agent for concrete is more important than ever.

Since the concept of air-entraining was first introduced by the cement industry in the 1930's, Vinsol has been widely specified for use in this field. Write to Hercules for technical data explaining the many advantages of Vinsol.

VINSOL®

Naval Stores Department
HERCULES POWDER COMPANY
INCORPORATED
900 Market Street, Wilmington 99, Delaware

NV59-1

Shown above — alloy cast steel sprocket 150,000 tensile strength, 125,000 PSI yield.

- STEEL - Carbon and low alloys
- NI-HARD - types I, II, III
- DUCTILE IRON - all grades -- Inco licensee
- GREY IRON - heavy, regular and alloy

Complete machining and testing facilities.

Treadwell engineers are specialists in the production of intricate castings for steam turbine, pump and similiar industries. Treadwell engineering was the first manufacturer of steel castings by the electrical furnace process in the United States. For any casting job call on the expert engineers of Treadwell.

TREADWELL

ENGINEERING COMPANY • EASTON, PA.

SALES AND ENGINEERING OFFICES:

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CHICAGO 4, ILL.
CEntral 6-9784

1015 FARMERS BANK BLDG.
PITTSBURGH 22, PA.
ATlantic 1-2883

Manipulators, Mill, etc.
Mills, Billet, Merchant & Bar
Mills, Rod
Special Machinery
Collars & Reels

Conveyors, Coil
Drives & Pinions
Ejecters, Furnace
Gauges, Shear, Saw, etc.
Beds, Cooling,

Mills, Vertical Edging
Tables, Mill
Tables, Tilting & Lift
Tables, Transfer
Transfers

Beds, Inspection
Bumpers, Furnace
Pushers, Furnace
Repeaters
Handling Equipment (Kick-offs, Pliers, Cradles, etc.)

CASTINGS—Electric Furnace Steel, Ductile Iron, Gray Iron and Ni-Hard

THE MAN WITH THE ★ MULTIWALL PLAN

UNION PACKAGING SPECIALIST DON DEININGER

saves Multiwall user $8 per M through specifications review

A leading company, already using 43 different sizes and types of Multiwalls, planned to add new products to its line. Union Packaging Specialist Don Deininger recommended a simplification of Multiwall specifications and inventory. Union prepared a Specifications Manual for the manufacturer, also simplified, unified and modernized his bag designs.

Results: user reported: (1) Union's recommendations for re-designing bag sizes and constructions in some instances saved as much as $8 per M. (2) The new Specifications book enabled the customer to order bags more easily and accurately. It also simplified his inventory control. (3) The new designs established a visual relationship between his family of products, enabled his sales force to do a better merchandising job.

Union Multiwall Recommendations are based on this 5-star Packaging Efficiency Plan

- DESIGN
- EQUIPMENT
- CONSTRUCTION
- SPECIFICATION CONTROL
- PLANT SURVEY

This is a typical example of Union's 5-Star Multiwall Plan in action. Perhaps it can produce gains in your own Multiwall packaging operation. Write for additional information.

Better Multiwall performance through better planning

® union camp

UNION'S PACKAGE ENGINEERING DEPARTMENT will study your Multiwall bagging methods and equipment and make appropriate recommendations, regardless of the brand of Multiwalls you are now using.

UNION MULTIWALL BAGS

UNION BAG-CAMP PAPER CORPORATION

233 BROADWAY, NEW YORK 7, N. Y.

Helical Gears by FALK

FALK PRECISION HOBBING MEANS LONGER GEAR LIFE

Pictured below are the Falk single helical gear and pinion recently installed on this 1100 hp mill. In Falk Helical Gears, whether single or double helical, several teeth are in simultaneous contact, thus sharing the load and providing smooth operation and performance which is vastly superior to that of conventional spur gears.

Thanks to an exclusive mechanism incorporated in Falk-designed, Falk-built hobbing machines, tooth spacing errors are reduced to an almost negligible minimum, so that the load division between teeth in contact is at its optimum. As a result, smooth power transmission is assured, thereby prolonging the service life of the gears and associated machines.

...your Best Buy in gears!

In these times of industrial expansion and modernization, Falk Helical Gearing is more than ever the first choice of experienced, economy-minded users of gear-driven equipment.

This increasing preference is the result of proved performance. Falk Helical Gears and Pinions provide *better performance over a longer service life* because they are correctly engineered...their accurately generated teeth have extra depth and extra capacity...gear efficiency, as shown by actual test data, is 98+%...the highest you can buy!

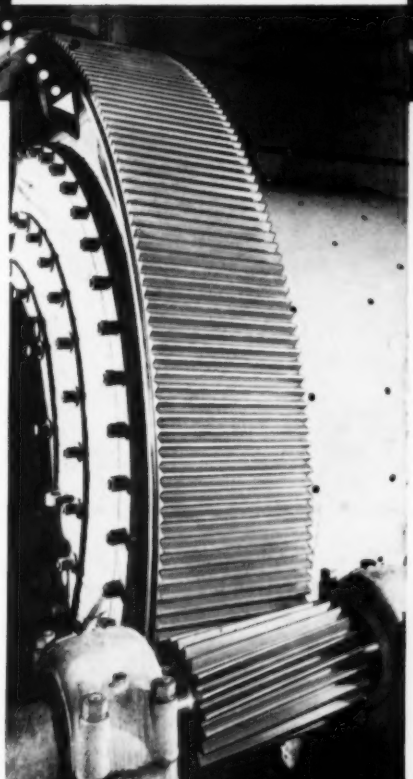
Other superior features include: high reduction ratios which permit use of higher motor speeds for greater efficiency and reduced power costs; maximum resistance against abrasive wear; smooth, helical gear action. All these factors contribute to the long service life of trouble-free operation for which Falk gears are famed the world over.

When expanding or remodeling your production facilities, it pays to remember that the performance of your equipment will not be any better than the performance of the gears that drive it. So, if uninterrupted production is important to you, specify Falk Helical Gears. They're available in sizes up to 18 ft. in diameter...in capacities up to 2000 hp.

Consult any Falk representative—also, write for **Engineering Report 6170,** "Advantages of Helical Gearing."

THE FALK CORPORATION, 3001 W. CANAL ST., MILWAUKEE 1, WIS.

Representatives in Most Principal Cities



FALK

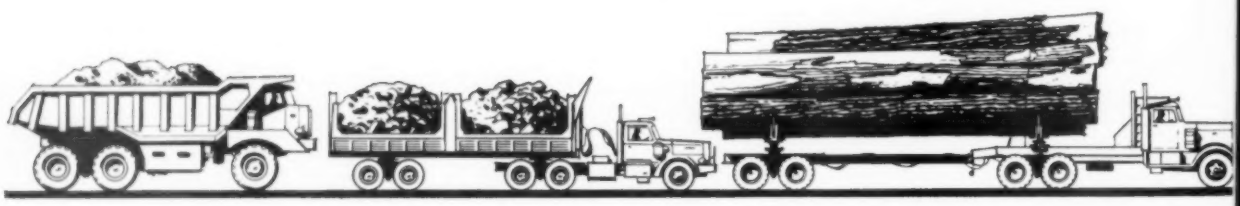
...a good name in industry

NEW, RUGGED... HI CAPACITY...

5-G-1220 Heavy-Duty, 5-Speed TRANSMISSION

LONGER LIFE *with pressure filtration and lubrication*
EASIER SHIFTING *with countershaft brake*

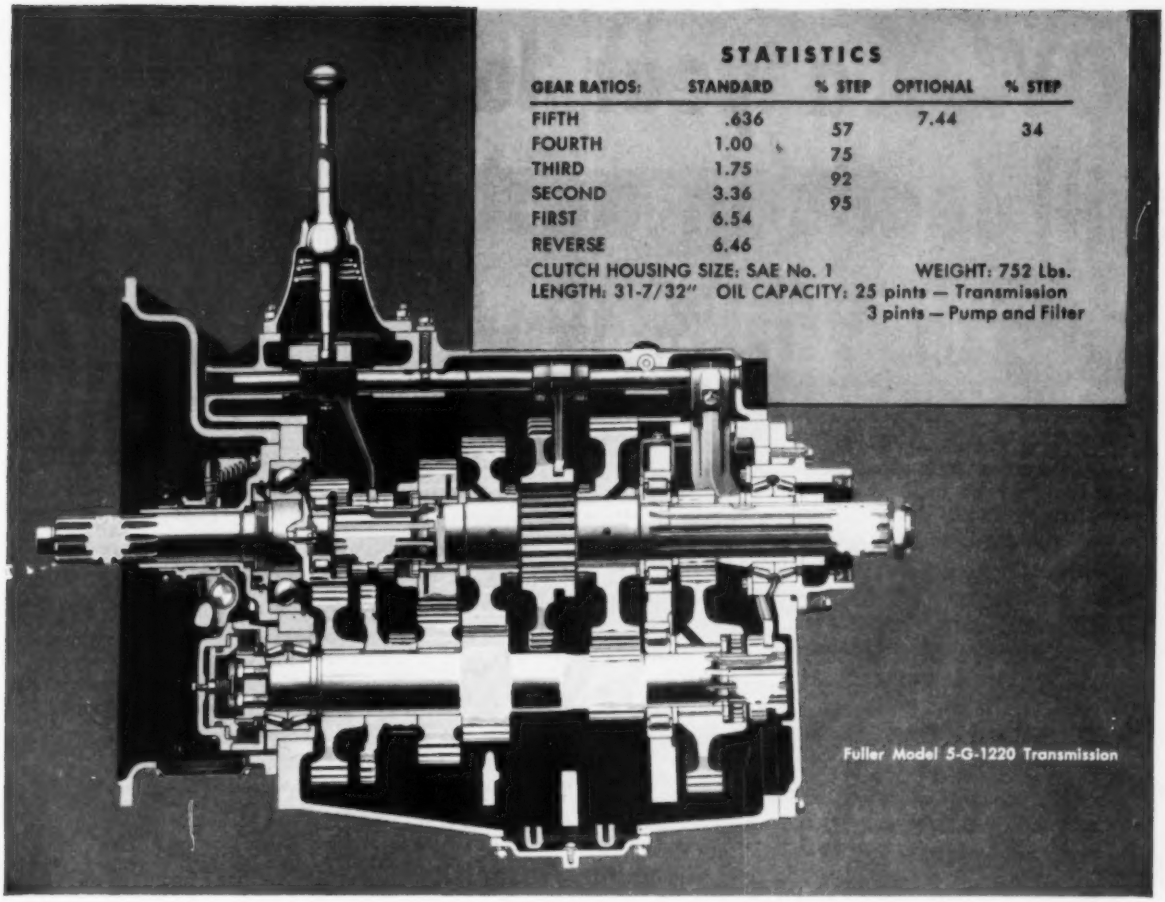
...for TOUGH



The Fuller model 5-G-1220 Transmission is engineered for heavy-duty operation in big earthmoving, logging, mining and quarrying equipment, including prime movers pulling scrapers of 12 to 14 cubic yards capacity. This new model is also designed for off-highway service in trucks equipped with engines of equivalent torque and horsepower.

Model 5-G-1220 offers higher capacity than other models in the '1220 series previously produced through elimination of axial thrust factors by the use of spur type gearing throughout the unit. As standard equipment

Unit Drop Forge Div., Milwaukee 1, Wis. • Shuler Axle Co., Louisville, Ky. (Subsidiary) • Sales & Service, All Products, West. Dist. Branch, Oakland 6, Cal. and Southwest Dist. Office, Tulsa 3, Okla.
Automotive Products Company, Ltd., Brock House, Langham Street, London W.1, England, European Representative


STATISTICS
GEAR RATIOS: STANDARD % STEP OPTIONAL % STEP
FIFTH .636 57 7.44 34
FOURTH 1.00 75
THIRD 1.75 92
SECOND 3.36 95
FIRST 6.54
REVERSE 6.46
CLUTCH HOUSING SIZE: SAE No. 1 WEIGHT: 752 Lbs.
LENGTH: 31-7/32" OIL CAPACITY: 25 pints — Transmission
3 pints — Pump and Filter
Fuller Model 5-G-1220 Transmission

off-highway service!

on the 5-G-1220, the following innovations are featured:

1. Pressure lubrication and filtration system;
2. Countershaft inertia brake.

The pressure lubrication and filtration systems provide positive lubrication of the mainshaft pilot bearing and mainshaft gear bushings, keep the gear oil clean between changes, and prolong gear and bearing life. The air powered countershaft brake, which is activated simply by pushing a button, permits quick upshifts without double clutching.

Both high production and reduced operating costs for off-highway jobs can be secured by using the 5-G-1220 Transmission. Ask your equipment dealer for further information about this unit, or write directly to the Fuller Manufacturing Company, Kalamazoo, Michigan.

FULLER — TRANSMISSION DIVISION — MANUFACTURING COMPANY
KALAMAZOO, MICHIGAN
Subsidiary EATON Manufacturing Company

NOW...a year later...same still leads in availability ...with 96.1% working record

—for Southern California Edison Co., Los Angeles, Calif.

A year later, in 1959, still meeting and beating machine-mauling High Sierra rock-hauling conditions—on Mammoth Pool Hydroelectric Project, for Southern California Edison—the same 10-unit International 95 Payhauler fleet is still turning in this excellent record of availability.

With 2,500 to 2,700 working hours clocked on each unit of the fleet, the 10 Payhaulers delivered 96.1 availability in a recent measured month. The Payhauler fleet never lost a day due to mechanical failure! Performance like this has helped advance job-completion date substantially ahead of schedule!

Southern California Edison Company credits their excellent results partly to strong-built, easy-to-maintain machines—partly to a methodical preventive maintenance program. Working view shows two Payhauler units highballing rock fill to the dam site in 1959—maintaining record high availability!

...NEW corrugated-body Payhauler models

New "95" Payhauler gains 3 tons in capacity, plus an additional 40 diesel hp.—with new corrugated body design and new 375-hp. turbocharged International DT-817 diesel engine.

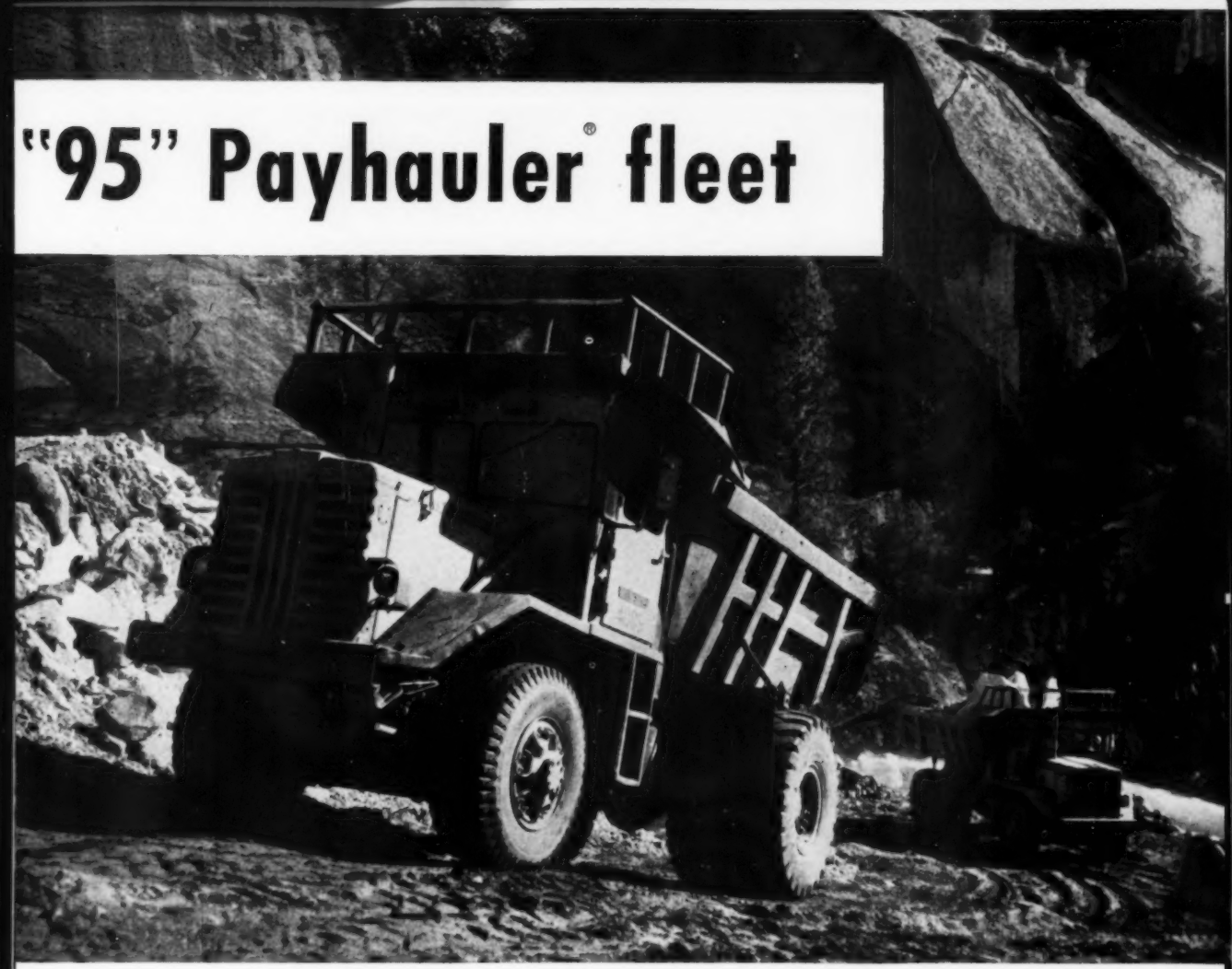
See those exclusive, rock-ribbed body corrugations! International applies this exclusive strength-multiplying principle to reduce the body-weight of new Payhauler models with these results:

- **New "95" Payhauler loses 2½ tons of power-wasting dead-weight; gives 3 extra tons of payload capacity!**
- **New "65" Payhauler sheds 5,000 pounds of useless "ballast"; gains a whole ton of new hauling capacity!**

And both these weight-streamlined Payhaulers have new International diesel power to highball the bigger payloads 14% faster than the previous models. These new Payhauler models have the power-to-weight ratio to out-cycle even lower capacity rigs.

Get the proof that new Payhauler models can deliver and keep delivering you the lowest material-moving costs in the off-highway hauling market. See your International Construction Equipment Distributor for a demonstration!

"95" Payhauler® fleet



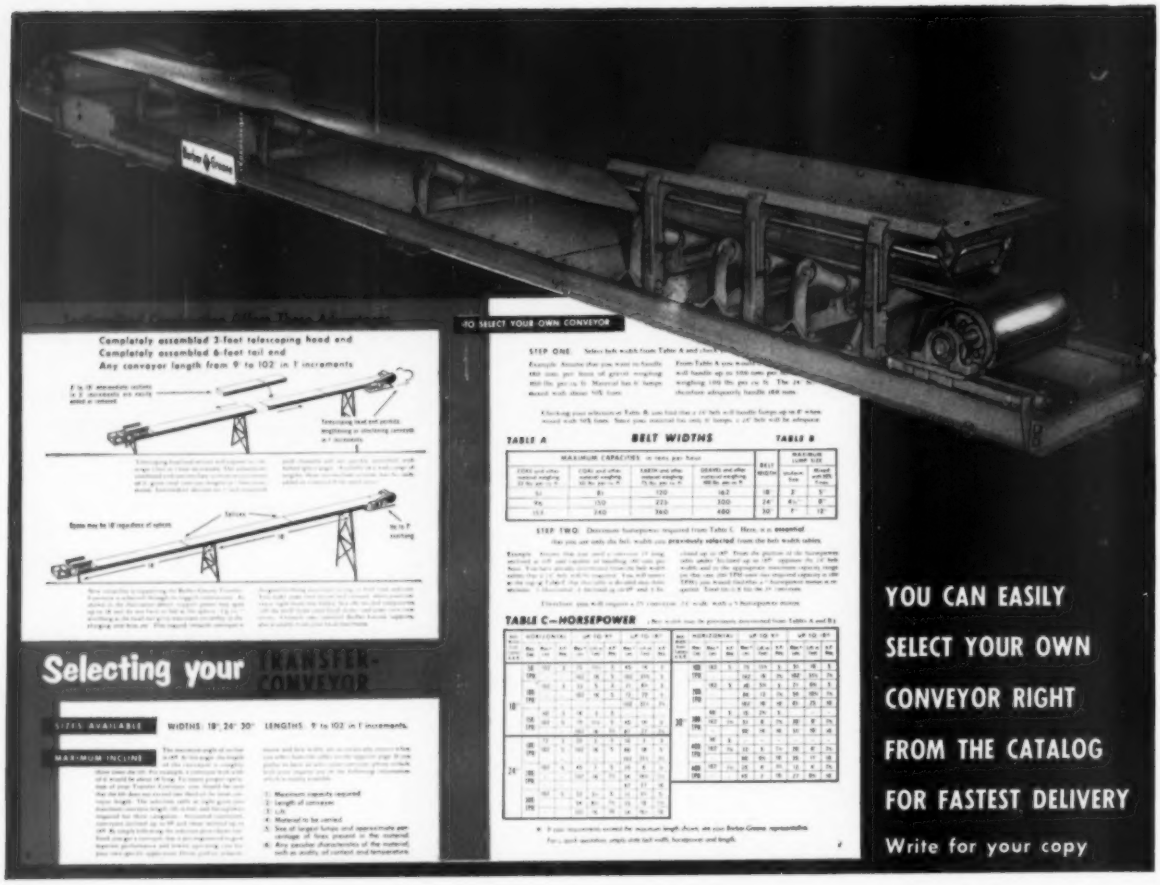
speed bigger loads...up to 14% faster!

New "65" Payhauler, the only 19-tonner, features International's *exclusive* new corrugated body principle. Powered by the naturally aspirated new 250-hp. International D-817 diesel engine.

International®
Construction
Equipment

International Harvester Co.
180 N. Michigan Ave., Chicago 1, Ill.

A COMPLETE POWER PACKAGE: Crawler and Wheel Tractors . . . Self-Propelled Scrapers and Bottom-Dump Wagons . . . Crawler and Rubber-Tired Loaders . . . Off-Highway Haulers . . . Diesel and Carbureted Engines . . . Motor Trucks . . . Farm Tractors and Equipment.


Completely assembled 3-foot telescoping head end
Completely assembled 6-foot tail end
Any conveyor length from 9' to 102' in 1' increments
Selecting your TRANSFER-CONVEYOR
TO SELECT YOUR OWN CONVEYOR
TABLE A BELT WIDTHS
TABLE B
TABLE C—HORSEPOWER
YOU CAN EASILY SELECT YOUR OWN CONVEYOR RIGHT FROM THE CATALOG FOR FASTEST DELIVERY
Write for your copy

New, low-cost belt conveyor now available in lengths to 102′

If you handle bulk materials, you should have a copy of the new Barber-Greene Transfer-Conveyor Catalog. With it, you can readily select your own conveyor. Belt width and horsepower are automatically correct for your job.

The Barber-Greene Transfer-Conveyor has cut costs on so many jobs that its range has now been extended to 102′ in 1′ increments. Belt widths are 18″, 24″ and 30″.

Because the Transfer-Conveyor is pre-engineered and made up of standardized components, special engineering time and expense are eliminated, and shipment is from stock—usually from the local distributor's stock. Erection is merely a matter of bolting the major components together and positioning the conveyor. Sectionalized construction gives flexibility for lengthening or shortening to meet future requirements.

Other Transfer-Conveyor advantages include:

Rigidly braced channel frame allows 7′ overhang at head end, 18′ spans between supports.

Head and tail end sections shipped completely assembled, aligned and adjusted.

Heavy-gauge steel decking protects return run of belt.

Worm gear reducer, running in oil, cuts maintenance expense.

Ball-bearing carriers assure long, trouble-free life.

Heavy thread screws provide belt tension adjustment.

Parts interchangeable and repair parts readily available.

58-20-PE

Barber-Greene BG

AURORA, ILLINOIS, U.S.A.

CONVEYORS . . . LOADERS . . . DITCHERS . . . ASPHALT PAVING EQUIPMENT

JOB RECORDS PROVE

Firestones move more payloads per tire!

Firestone off-the-highway tires lower earthmoving costs by cutting downtime and staying on the job longer! Every Firestone tire is built with Firestone Rubber-X, the longest wearing rubber ever used in Firestone tires. Tough Firestone treads and sidewalls defy cuts in rubble and shale. And Firestone S/F (Shock-Fortified) nylon cord bodies withstand bruising shock and impact to deliver maximum tire life! Count on Firestone off-the-highway tires for new low costs-per-hour! See your Firestone Dealer or Store and ask about the full line of tubeless or tubed off-the-highway tires and Firestone on-the-job service.

Rock Grip Excavator Wide Base Rock Grip Excavator

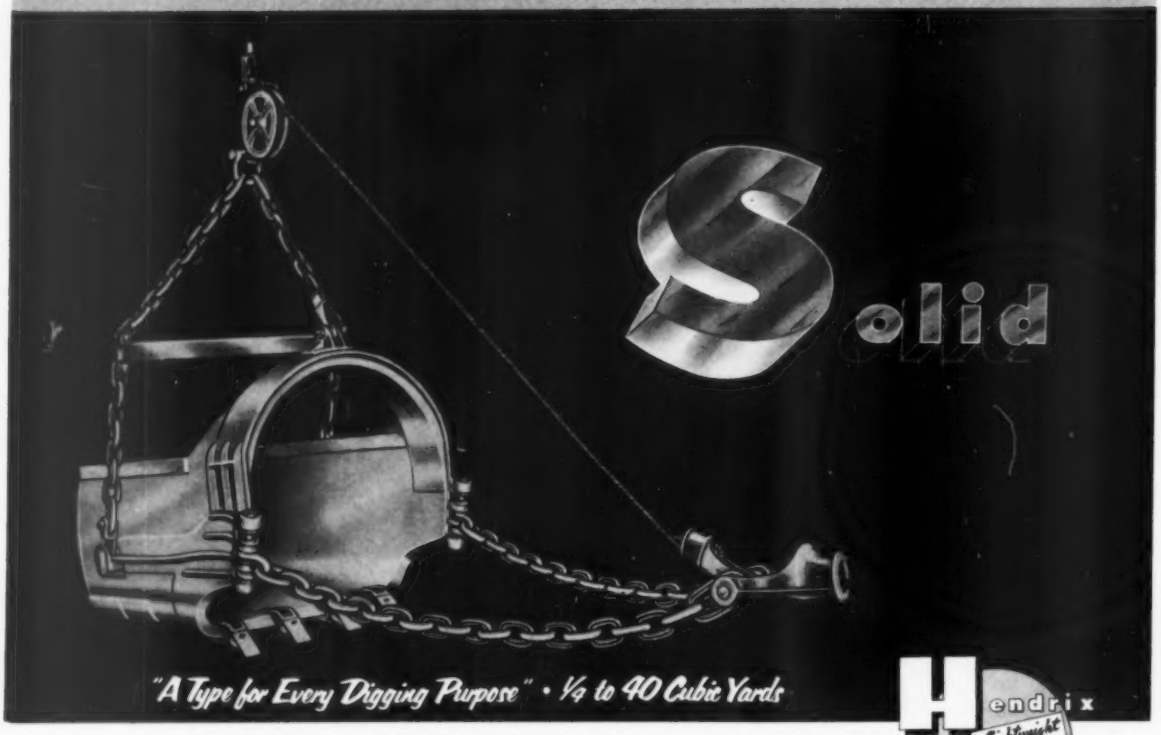
When ordering new equipment always specify Firestone tires—available tubeless or tubed.

Firestone

BETTER RUBBER FROM START TO FINISH

Copyright 1959, The Firestone Tire & Rubber Company

HENDRIX DRAGLINE BUCKETS



HENDRIX MANUFACTURING CO., Inc.

MANSFIELD, LOUISIANA

WHEELABRATOR® GLASTUBE

Dust Collectors work where it's HOT

OVER A MILLION CU. FT. OF GAS EVERY MINUTE
IS FILTERED THROUGH GLASS BAGS
IN WHEELABRATOR DUSTUBE COLLECTORS

Wheelabrator engineers are fully experienced in designing dust and fume collection equipment for high-temperature applications using Glastube glass fabric filter bags. Over the past five years, many Glastube installations have been made to handle hot gases . . . over a million cu. ft. of gas is filtered every minute in these applications.

Glastube collectors provide unexcelled (nearly 100%) consistent efficiencies. Temperature up to 550°F in closed baghouses and inlet temperatures up to 750°F are handled without difficulty. Corrosion due to moisture can be eliminated when higher temperatures are required. Cooling equipment is either unnecessary or can be materially reduced. No shaking or moving parts are required; collected material is discharged by repressuring.

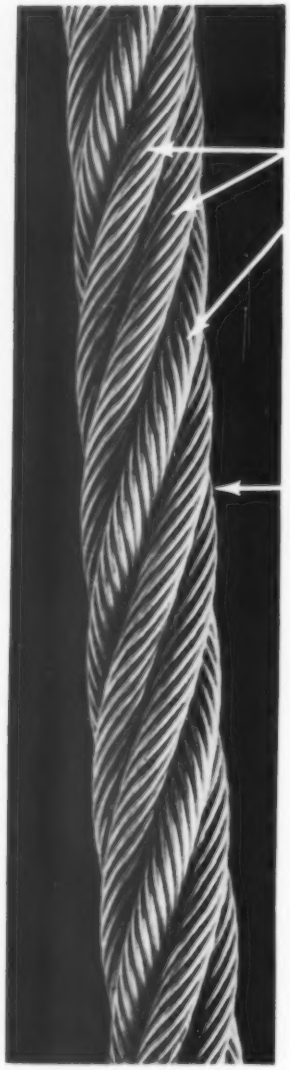
If your problem is the ventilation of kilns, furnaces, kettles, driers and similar high temperature operations, it will pay you to investigate Wheelabrator Glastube Dust Collectors. Write today for full information.

Send today for your free copy of the new brochure, "Industry relies upon Dustube Collectors for efficient dust and fume control." Ask for Bulletin No. 562-D.

WHEELABRATOR
CORPORATION

1280 South Byrkit Street **Mishawaka, Indiana**

Canadian Offices: Scarborough (Toronto) – Montreal



Herringbone's two pairs of Lang lay strands and one pair of regular lay strands provide the ideal combination of maximum flexibility with good stability.

Finer wires inside contribute to Herringbone's excellent drum-winding characteristics.

Heavier outside wires in each strand have greater resistance to abrasion.

"...and it has a much longer life"

GASKILL CONSTRUCTION COMPANY

The above quote is one of the things that Gaskill Construction Company says about the new Roebling Herringbone* Wire Rope. There are further quotes: ". . . We, after giving your Herringbone cable a great deal of use, find that it is far superior to any other cable and it is much more economical."

These are *user* statements about the newest design development in wire rope in many years. Herringbone is the regular lay and Lang lay wire rope. It is two-ropes-in-one rope, with the best features of each in combination. It has been used, with the same success quoted here, on a wide variety of machines as well as on tough hoisting jobs. Its potential is virtually unlimited wherever all-steel ropes are specified and on most installations where fiber core ropes are standard.

Your Roebling Distributor has full details on Herringbone, or contact Wire Rope Division, John A. Roebling's Sons Corporation, Trenton 2, New Jersey.

*Reg. App. For

ROEBLING

Branch Offices in Principal Cities
Subsidiary of The Colorado Fuel and Iron Corporation

SIMPLICITY

GRIZZLY FEEDER

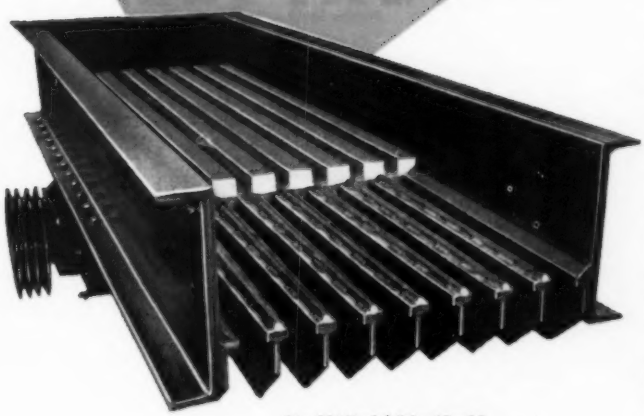
3' x 10' Model OA—10—A3

eliminates need of apron feeder and scalper . . .

Rock can't jam . . . hourly operating costs lowered

The unique design of the Simplicity Grizzly Feeder, which combines feeding and scalping in one operation, eliminates rock jams thus assuring positive uniform flow of material into the crusher.

One operator of a Simplicity Grizzly Feeder says: "... we have used the heaviest type of apron feeders for years and have found it necessary to shut down at least 2 or 3 times a year to hard surface the flights, inasmuch as our material is so abrasive ... we installed a Simplicity (Grizzly) Feeder ... with 1/4" pan and 3/16" liner ... and are glad to report that, AFTER 9 MONTHS OF CONTINUOUS OPERATION, THE FEEDER PAN SHOWS PRACTICALLY NO WEAR WHATSOEVER, and is operating around the clock doing an excellent job of feeding at all times ..."



3' x 12' Model OA—10—A3

The Grizzly Feeder costs less than 50% of the combined apron feeder and scalper ... weighs considerably less ... makes a more compact plant ... and reduces loading height by several feet. While these factors show up so prominently in portable plant production, they are just as effective in a permanent plant installation for the crushed stone, sand and gravel and mining industries.

214

Send for Catalog #571 for complete information on OS-A-VEYOR and GRIZZLY FEEDERS.

SALES REPRESENTATIVES IN ALL PARTS OF THE U. S. A.
FOR CANADA: Simplicity Materials Handling Limited, Guelph, Ontario
FOR EXPORT: Brown & Sites, 50 Church Street, New York 7, New York

Simplicity
TRADE MARK REGISTERED

ENGINEERING COMPANY • DURAND 12, MICHIGAN

Enter 207 on card, page 255

D9

D9s take another hard work job in stride

Near Santa Anna, Texas, there's a vein of 99% pure silica sand 30 feet deep—enough to last one hundred years at present removal rates. To get to the sand, the Santa Anna Silica Sand Company has to blast and 'doze away a 60-foot layer of hard rock and shale overburden.

Working two shifts a day, two Caterpillar D9 Tractors move 2,000 yards a day, six days a week. It's all uphill for distances of 250 to 300 feet—but it's no struggle for the mighty D9s. One racked up over 5,200 hours and the other had almost that many—before the rails needed replacement. "That's really long wear when you consider the conditions they work in . . . all rock, shale and sand," observes Executive Vice President Robert L. Markland.

Conditions like these let the D9 really prove its superiority. Thirty tons of work-power, sparked by a 320 HP (at the flywheel) Turbocharged Cat Diesel Engine, pile into the job and keep production up in the roughest going.

For all its mighty power, the D9 is maneuverable and responsive. Hydraulic boosters help with braking, steering and clutching. The exclusive Caterpillar oil clutch rarely needs adjustment. The optional D9 heavy-duty torque converter transmission has the flexibility to quickly compensate for load changes. And now the D9 has new lifetime lubricated rollers and idlers that are service-free until time for rebuilding.

A new dry-type air cleaner that removes at least 99.8% of all dirt and dust from engine intake air during *every* service hour, under *any* conditions, makes the D9 even better suited for work in pits and quarries.

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THE TAKE-CHARGE D9—
BUILT FOR THE HARD WORK

Legal Decisions

On Industry Problems

By LEO T. PARKER
Attorney at Law
Cincinnati, Ohio

A reader recently submitted this question: "If an agent or employee makes a contract intending to obligate his employer, under what circumstances is such a contract void and unenforceable?"

The law is well established in all states that only a properly authorized employee can make a valid contract which obligates his employer. The mere fact that an employee makes a contract intending to obligate his employer does not obligate the employer unless the other party to the contract convinces the court and jury that the employee had proper and legal authority to act for his employer.

For example, in *Johnson* v. *Shook and Fletcher,* 16 So. (2d) 406, the higher court refused to hold a sand and gravel company liable on a contract made by an agent who signed a contract which was intended to obligate the company to mine and deliver 2,500,000 tons of non-metallic material and haul it from a washer to a crusher.

In subsequent litigation, the higher court decided that the testimony did not prove that the agent and employee was authorized by the company's officials to make the contract. Therefore, the company was held not liable on the contract. Also, this court held that one dealing with an agent must not blindly trust the agent's own statements as to the extent of his authority to make contracts which obligate his employer. He must know that the employee has such authority, otherwise he cannot enforce the assumed obligations.

For comparison, see *Bureau* v. *Whealton,* 145 Pac. (2d) 912. In this case the higher court held that a contract made by an unauthorized agent is void, and cannot be given any legal effect whatever.

Cannot Enlarge Operations

A reader wanted to know whether or not he can add new machinery to his plant that is located in an area restricted by a new city ordinance against operation of such a plant.

It has been clearly established that a new city zoning ordinance is not ordinarily an effective means to stop operation of a previously established plant. However, this new ordinance is valid and effective to prevent any new operations, or substantial additions to the plant.

For example, in *Allen* v. *Zoning Board,* 66 Atl. (2d) 369, the testimony showed that a property owner applied to the city board for a permit to erect a 20 by 40 ft. building to be used for a washing plant on his land which is a residence B area in the city. The testimony showed further that the property owner had carried on his business before the zoning ordinance was enacted, but that he had operated his washing plant by means of portable machinery.

Several owners of nearby property filed suit to prevent issuance of the permit on the grounds of potential depreciation of their property values, noise, dust, and increased highway hazards, especially to children.

Since previously the property owner had used only portable machinery, the higher court refused to order the board to issue a building permit for the erection of a new building to enlarge the plant and house stationary machinery to wash gravel. The court said:

"The application was confined to a request for permission to erect a building for a washing plant, to house machinery in connection with gravel operations. . . . We construe the decision of the board to mean that the petitioner (property owner)

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BEST BUYS IN NEW AND USED EQUIPMENT

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was denied permission to erect a building for a washing plant. We cannot say that the decision of the board was unreasonable or arbitrary."

Surety Is Liable

Another reader asked whether or not a contractor's surety is liable on its bond for payment of money loaned to the contractor by a person who merely desired to accommodate the contractor. According to a late higher court decision, the answer is in the affirmative.

For example, in *Western Casualty & Surety Company* v. *Meyer,* 192 S. W. (2d) 388, the testimony showed that one West borrowed $72,000 and turned it over to a contractor who used it to pay a materialman. Later the contractor defaulted on his contract, and West filed suit against the Surety Company to recover this amount. Ruling in favor of West, the higher court said:

"We have here at hand a case where the money was advanced to the contractor for the specific purpose of paying certain obligations already incurred for labor and material."

For comparison, see *Movl Construction Company* v. *Covington Trust & Banking Company,* 258 Ky. 485. This higher court held that a bank which advanced money to an excavation contractor to pay materialmen and laborers could recover this money from the surety which had signed the contractor's bonds, where the contractor defaulted.

Law of Taxes

Several persons have asked questions relating to the validity of sales and use taxes. For instance, a reader stated: "I quarry stone and use it to construct buildings. Can a state compel me to pay use taxes on the full amount of my contract or only on the value of the stone?"

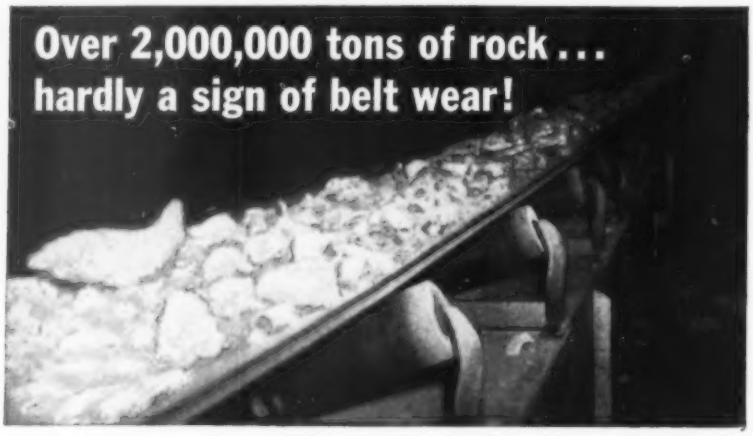
According to a decision by a leading higher court, a state can assess "use" taxes only on the actual value of rock, marble, etc. used in a construction job.

For illustration, in *Gray Knox Marble Company* v. *Evatt,* 16 Ohio Supp. 151, it was shown that a marble company, located in Tennessee, took a contract to furnish the labor and materials necessary to complete certain marble work on a building in Ohio.

The Ohio taxing authorities contended that the marble company must pay "use" tax on the complete marble work, or the contract price of $48,883.

The higher court refused to agree with this contention, holding that the Gray Knox Marble Company was liable for payment of "use" tax only on the valuation of the marble and based upon its actual cost, including the labor cost of fabricating it.

Another leading higher court interpreted law to the effect that if a plant owner charges a certain price for non-metallic materials, and includes in this charge the cost of transportation, the seller is liable for payment of the sales or use tax on the full amount. On the other hand, if the seller separates the transportation charges from the selling price of the materials he need



That's the story behind the New York Rubber Stonore Nyrex conveyor belt, in regular, daily use by a large stone company. In this crushed stone plant, this heavy-duty belt carries stone from the primary crusher, located under the floor of the pit, over a belt distance of 455 feet at a 19° angle.

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pay sales or use tax only on the selling price of the materials.

For example, in *Whitehall Sand and Gravel Company* v. *State Tax Commission,* 150 Pac. (2d) 370, the testimony showed that a company, engaged in selling sand and gravel, usually paid "sales" tax on the price charged gravel at the pit, but in some cases it hauled the material or arranged for transportation to the purchasers.

In subsequent litigation, the higher court held that the company must pay the state "sales" tax on the total price of the gravel at the pit plus charges, if a single bill (which included the price of the materials) was given the purchaser. The court stated its important interpretation as follows:

"They would constitute sales of the products at the point of delivery including transportation charges, regardless of the general policy to sell at the pit."

Hence, this court held that the company could pay the state "sales" tax only on the price of materials at the pit if separate bills were rendered for the transportation charges.

Must Pay for Services

Another reader asked this important legal question: "If an architect or engineer has in the past always rendered services free of any charge to a contractor or company, can such architect or engineer sue and recover payment for services rendered on a present job?"

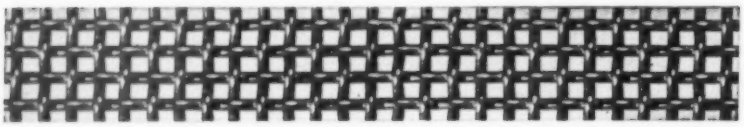
For illustration, in *Western Asphalt Company* v. *Valle Company,* 171 Pac. (2d) 159, the testimony showed data as follows: The Valle Company anticipated getting a large contract to construct a government project, and notified the Western Asphalt Company which proceeded to furnish its engineering services in computing estimated costs relating to contemplated use of asphalt and soil stabilization.

Later the Valle Company submitted its bid on the government project for $1,996,000 and was awarded the contract because it submitted the lowest bid. The Western Asphalt Company submitted a bill to the Valle Company for the amount of $43,000 for services rendered.

The Valle Company contended it could not be held liable for the following reasons. First, in the past the Western Asphalt Company always had rendered similar services without expectation of compensation, except when it received subcontracts for the installation of asphalt paving if and when the general contractor to whom it had furnished data had been awarded the contract for the entire job. Second, there was no agreement or promise that the Valle Company would pay the asphalt company for its services rendered when computing costs relating to the asphalt pavement and soil stabilization.

Although the jury refused to render a verdict in favor of the Western Asphalt Company, the higher court reversed the verdict, and said:

"It is not necessary that the defendant (Valle Company) should have believed that the plaintiff (Western Asphalt Company) expected pay . . . Where services of a beneficial character are performed



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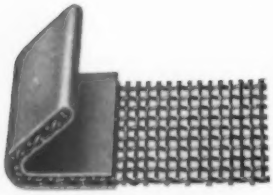

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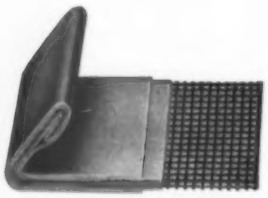

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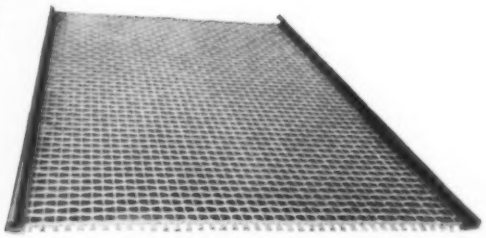

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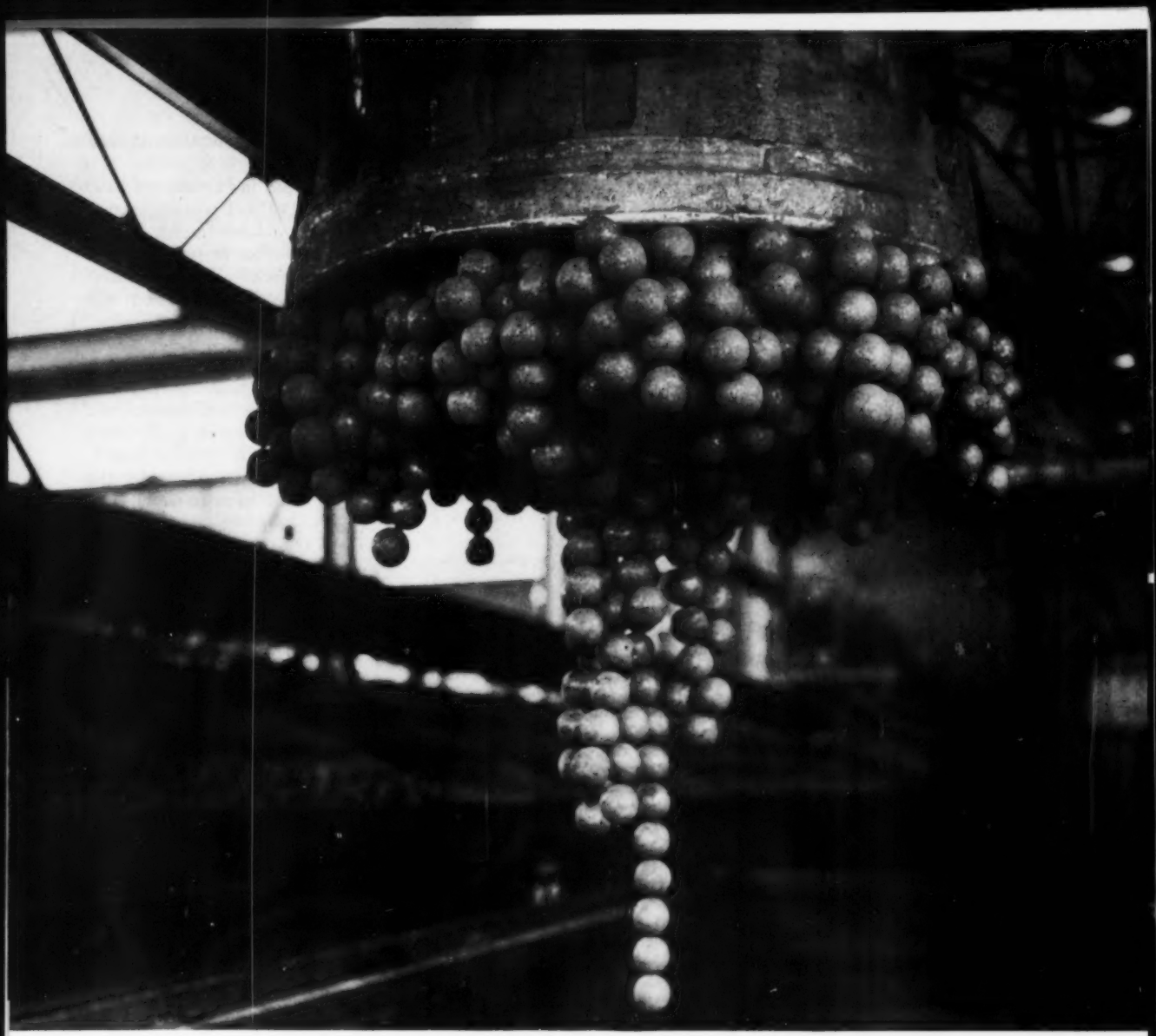

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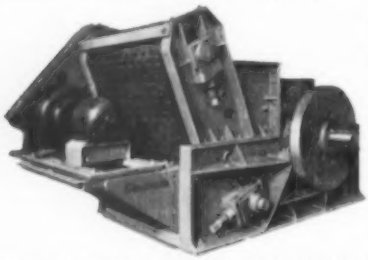

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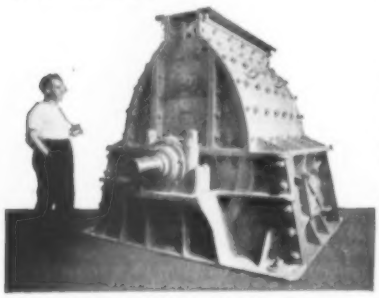

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by one for another with the latter's express or implied assent, or upon his request, a promise to pay will be implied if the circumstances were such as to . . . raise a presumption that compensation was expected."

This court went on to explain that circumstances may exist under which one who performed services cannot charge for such services. However, these circumstances are rare and must be based upon positive testimony showing that at the time the services were rendered neither party expected nor anticipated that a charge would be made.

Jury Believes Wife's Testimony

A reader asked: "Do the courts ever base a judgment on testimony given by an interested witness? I have heard that testimony given by a wife has no value in a law suit involving the husband."

Generally speaking, courts will not base judgments on testimony of interested witnesses. But, if the amount involved is relatively small or a wife's testimony is unusually convincing, the court may do so.

For illustration, in *Travis* v. *Brock Lime Company*, 29 So. (2d) 545, the testimony related these facts: A truck owner sued the Brock Lime Company for hauling 100 tons of lime at $1.50 per ton, or a total of $150. Brock, owner of the Brock Lime Company, and his wife contended that the truck owner had verbally agreed to haul the lime at $1 per ton, whereas the latter testified that the agreed price was $1.50 per ton.

The higher court allowed the truck owner only $1 per ton, saying:

"In view of the fact that Brock and his wife testified positively that this $1 per ton was the agreement, we think the statement should be accepted. In any event, the difference is so small that we think substantial justice would be done by accepting this $100 as the proper balance."

Don't Violate Safety Laws

Modern higher courts consistently hold that the State Workmen's Compensation Act ordinarily protects employers from suits by injured employees for damages. However, where the employer fails to supply needed safety devices for his employees the state compensation laws do not protect the employer against damage suits.

For example, in *Peerless* v. *Pharr*, 40 S. E. (2d) 106, it was shown that an employer did not furnish an employee with rubber gloves to protect him from a chemical solution. Consequently the dye poisoned the employee.

This court held that the employee could sue the employer for damages. This court also held that all employers must use reasonable care and diligence to provide a safe place for employees to perform work. Failure to do so results in the employer being liable in damages.

Also, see the case of *Watson* v. *Carthage Marble & White Lime Co.*, 290 S. W. 649. In this case the owner of a plant removed stone from a quarry to a mill, where the stone was cut or sawed into the dimensions desired. Long thin saws without the teeth were used to cut the stone. These saws were operated by machinery, and had a hole in each end in which a dog was bolted by means of wedge-shaped steel keys.

When it was necessary to change saws, the foreman would put the keys in the dog opening at one end and the workmen put them in at the other, and upon a signal from the foreman the workman would drive in the key at his end.

One day a workman placed a key in the opening in the dog, and upon receiving a signal from his foreman struck the key with a hammer. The key flew out and struck him in the eye, inflicting a serious injury.

The injured employee sued his employer for heavy damages, contending that the accident was caused through negligence of the employer and foreman because they had provided a defective key.

The lower court held the employer liable, but the higher court reversed this verdict. In holding the injured employee not entitled to a recovery, it said:

"The employer is not an insurer of the safety of his employees. He must, however, exercise ordinary care to furnish his employees a reasonably safe place in which to work and reasonably safe tools and appliances with which to work. . . . Along with the duty of the employer to use ordinary care for the safety

of his employees goes the duty of the employee to use ordinary care for his own safety."

Must Sue Under Federal Laws

A reader asked: "Who is liable for damages to private property caused by a private company while performing work authorized by the federal government?"

The government is solely liable and, furthermore, the suit must be filed in a federal court and not in a state court.

For illustration, in *Scan* v. *Iron City Sand and Gravel Company,* 29 Atl. (2d) 82, the testimony showed that the United States Government licensed the Iron City Sand and Gravel Company to take sand and gravel from the bottom of a river. Thereafter, a man, named Scan, purchased an island in the river. Later Scan sued the Iron City Sand and Gravel Company for damages, alleging that the company's dredging damaged his island in the sum of $50,000. Scan sued to recover three times that sum, pursuant to a state law.

The higher court refused to allow Scan any damages, and explained that if Scan sustained any recoverable damage due to the federal government's authorized work his remedy, if any, was under the Federal laws.

Legal Strength of Easements

The owner of a rock quarry asked this question: "Is a clause in an old deed which gives a right of way for 'vehicles' usable now?" In other words is this easement construed by modern day courts to exclude gravel?

The answer is no, unless the deed clearly states that the right of way is for teams or horse drawn vehicles only.

For example, in *Hodgkins* v. *Bianc,* 80 N. E. (2d) 464, the testimony showed these facts: A man, named Bianc, owned several trucks which he used to haul sand and gravel. Later he purchased real property having a gravel pit thereon. The original deed on the property, dated 1820, gave an easement to "use a lane" through adjacent private property to get to the gravel bank. This clause in this deed simply specified that the lane could be used as a cart road. The owner of

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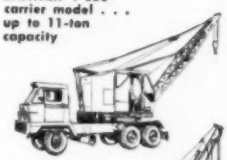

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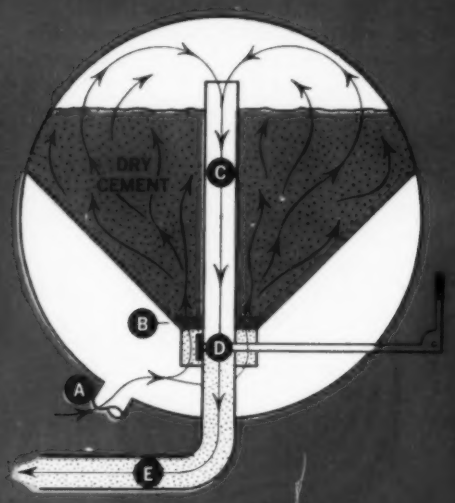
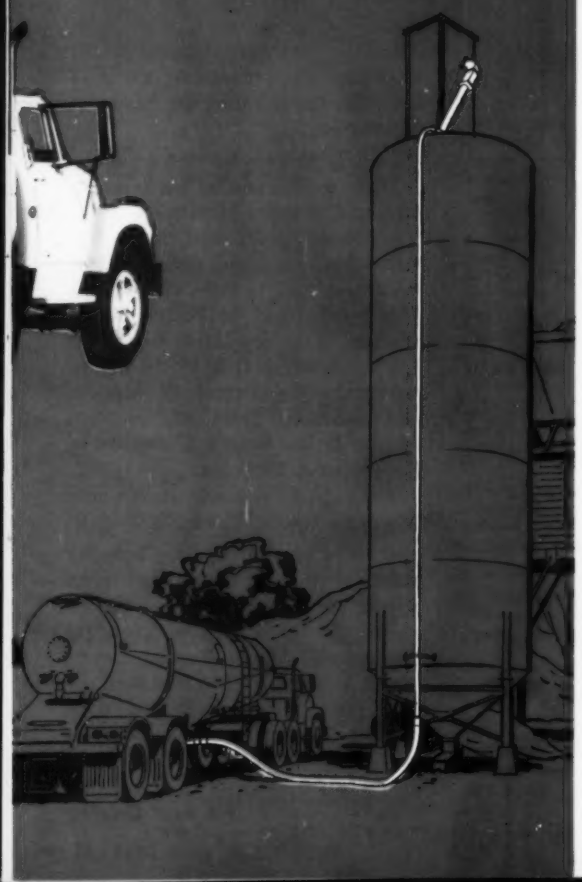


Schematic view illustrates principle of pneumatic discharge.

Air enters tank at point (A) and flows up through fabric Airslide (B) to put dry cement in air suspension. Air then flows down outlet pipe (C) The opening of valve (D) allows fluidized cement to enter air stream and the mixture is carried out to silo or batch plant through hose (E)



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Because discharge is made directly to the top of storage silos or batch plants, there's no need for elevator systems of any kind. A 4" pipe does the job. And since the discharge flow is inside a hose and/or pipe, unloading can be completed in any kind of weather.

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Raymond
MULTIWALL BAGS

RUGGED to serve the Building Trades

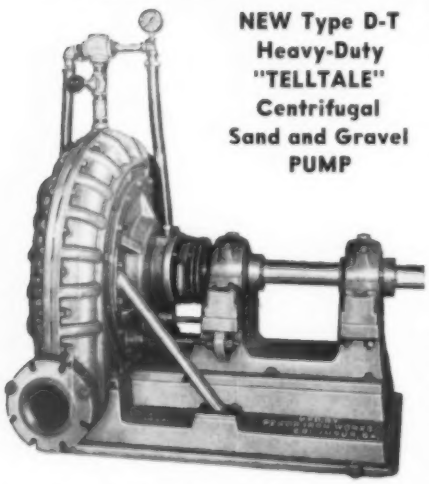
Quality controlled to your specifications for trouble-free production in your plant.

RAYMOND BAG CORPORATION
Middletown, Ohio
A division of
Albemarle Paper Mfg. Co.

District Offices:
New York · Chicago · Kansas City
Baltimore

Enter 218-A on card, page 255

A PUMP UNCHOKES ITSELF AND KEEPS ON ROLLIN' ALONG



NEW Type D-T Heavy-Duty "TELLTALE" Centrifugal Sand and Gravel PUMP

"Another thing hard to believe is that whenever a plug blocks the line we are able to put on a few more RPMs and raise the pressure enough to blow it on through — which would happen with no other pump I ever owned."

So says Wilson Brisbois, American Stone Products, 6335 Sashabaw Road, Clarkston, Mich., reporting 175 to 200 cubic yards of sand and gravel per hour produced by his 8 x 10" Type D-T Heavy Duty "Telltale" Pump.

AS LOW IN DOWNTIME AS IT IS HIGH IN PRODUCTION

The useful and exclusive telltale feature is one of all the best retained in the latest "Telltale" pump, only type we now manufacture.

Some new features: New highs in production—new lows in downtime, because of simple foolproof assembly for changing parts—also "Telltale's" own.

Available with either tough semi-steel or best-in-the-long-run Ni-Hard wearing parts in 4", 6", 8", 6 x 8" suction and 8 x 10" suction. Now available also in either alloy, 45 and 90° extra-heavy long-radius flanged elbows. Write for Type D-T Heavy-Duty folder and prices.

PEKOR IRON WORKS, INC.

LOCK DRAWER 909 — ESTABLISHED 1892 FAIRFAX 2-4020 — COLUMBUS, GEORGIA

Enter 218-B on card, page 255

the private property sued Bianc and asked the higher court to enjoin him from using the lane to haul gravel in his trucks.

The higher court refused to do so, and said:

"A 'cart road' used in the earlier deed constituted, we think, a grant of a general right of way for vehicles and did not restrict its use to horse drawn vehicles or limit the road to the width of vehicles then in common use."

For comparison, see *Clarkin* v. *Duggan,* 292 Mass. 263. Here a deed contained a clause which gave a right of way for "teams only".

This court held that the easement obviously did not include use of automobiles.

Eastern Lime Debenture Issue To Finance Expansion Plan

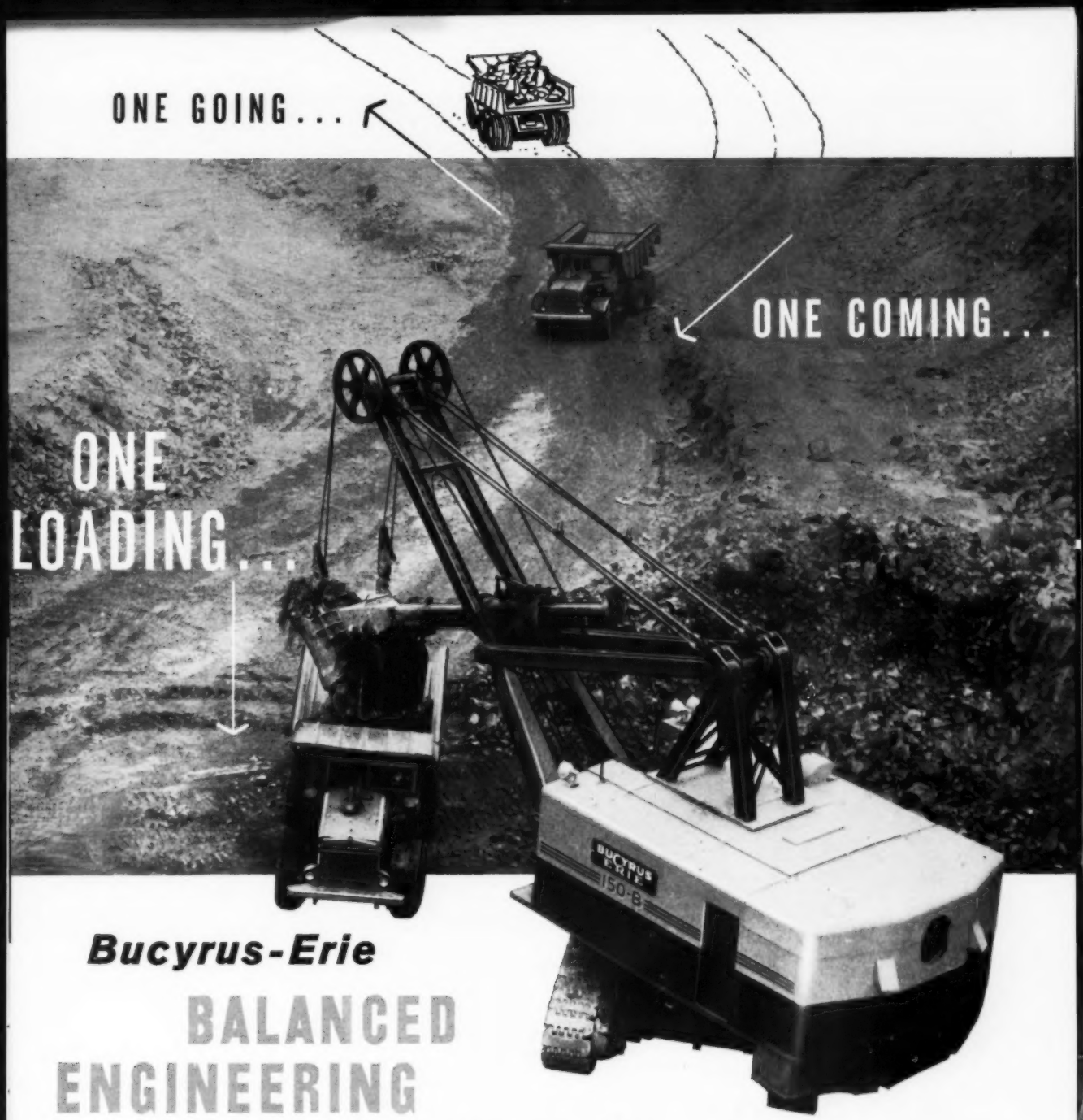
Increased output during 1959 will be achieved by Eastern Lime Corporation, Kutztown, Pa., through the purchase of additional equipment provided from a $300,000 debenture issue. Proceeds from the issue will purchase power shovels, hauling trucks and related quarry and processing plant equipment.

Demand for high-calcium limestone and commercial stone produced at the firm's Kutztown and Oley quarries is reportedly ahead of last year, necessitating the increased production.

Daily production of portland cement at Cementos Mexicanos, S. A., was recently increased from 800 metric tons to 1,350 tons, with the installation of a fifth kiln at the Monterrey plant in Nuevo Leon, Mexico. The new kiln, measuring approximately 400 ft. by 10 ft. and reportedly the largest in Mexico, was purchased from and installed by the F. L. Smidth Company of Copenhagen, Denmark.

Robert Vervaeke, former manager of Chemical Lime Company plant at Baker, Oreg., has been appointed general manager of the H. K. Porter Company plant at Pascagoula, Miss. Recently completed at a cost of $16,000,000, the new plant is reportedly the most modern basic refractory brick plant in the United States.

Enter 219 on card, page 255 →



Bucyrus-Erie BALANCED ENGINEERING keeps trucks on the move

How can you be *sure* of high production? Consider this: *more quarry and mine operators depend on Bucyrus-Erie electric shovels than any other.* Performance on the job proves that they are more rugged, stay on the job longer, require less service and maintenance.

Behind this kind of performance is Bucyrus-Erie *Balanced Engineering* . . . engineering that makes sure that all components are soundly designed, soundly built. The voltage control system is an example. It delivers fast acceleration and deceleration the instant you need it . . . gives you high torque at low speeds, high speeds at low torque . . . and is designed to be *consistently dependable.*

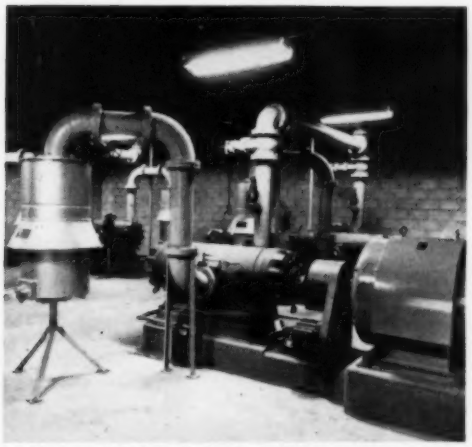
For the complete story on *Balanced Engineering,* write Bucyrus-Erie Company, South Milwaukee, Wisconsin, Dept. 2LG.

Bucyrus-Erie means . . .

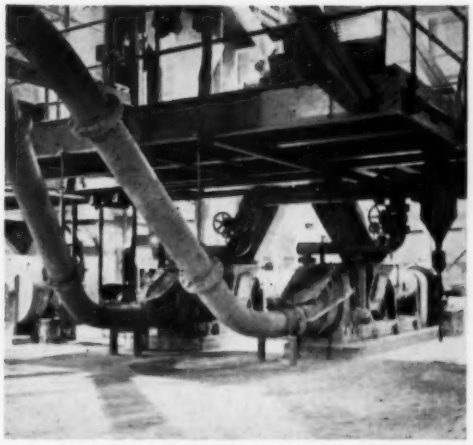
Balanced Engineering

BUCYRUS ERIE®

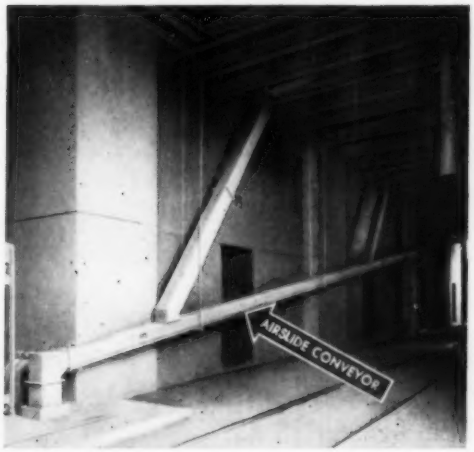
FULLER MATERIALS HANDLING EQUIPMENT HELPS CEMENT PLANT TRIPLE CAPACITY



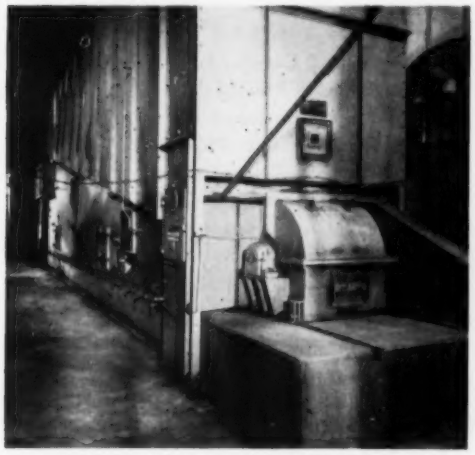
Group of C-300 single stage Fuller rotary compressors furnishing air for the Fuller-Kinyon pumps in raw-finish department.



Two 10″ Fuller-Kinyon pumps in raw mill pumping material to blending silos.



F-H Airslide Conveyor under new finished cement silos feeding to Fuller-Kinyon pump for redistribution.



One of three Fuller Inclined Grate Coolers in kiln building.

Automation with a variety of Fuller equipment at Lehigh Portland Cement Company's Union Bridge, Maryland plant has helped triple capacity from 1,000,000 to 3,000,000 barrels a year.

In this installation, Fuller-Kinyon pumps handle both cement raw material and finished cement to and from process.

Fuller rotary compressors furnish air for both the Fuller-Kinyon pumps and general plant air.

Airslide® Fluidizing Conveyors are used at various stages of both the raw and finished mill operations in feeding both raw material and finished cement to and from process and storage.

Clinker is discharged from three 400′ kilns and cooled to about 145°F. by three Fuller 7′ x 44′ Inclined Grate Coolers.

This wide range of Fuller systems and equipment in the field of pneumatic handling makes it possible for Fuller to find the method of moving dry bulk granular materials best suited to your particular application. Why not write for complete details today? 1324 G-198-T

FULLER COMPANY GENERAL AMERICAN TRADE MARK

FULLER COMPANY
100 Bridge St., Catasauqua, Pa.
Subsidiary of General American Transportation Corporation
Birmingham • Chicago • Kansas City • Los Angeles • New York • San Francisco • Seattle

Fuller
....pioneers in harnessing AIR

FOR DEPENDABILITY
PLUS ECONOMY
REPLACE WITH
INDIAN BRAND

Get the most out of your present equipment. When you need replacements, remember we started in 1913 to build our reputation in the Manganese Steel field for dependability plus economy.

Insist on
INDIAN BRAND
MANGANESE STEEL

Shovel Dippers • Dipper Teeth
Shovel Treads
Crusher Jaw Plates
Mantles • Concaves
Bowl Liners • Roll Shells
Pulverizer Hammers
Grate Bars • Breaker Plates
Ball Mill Liners • Screen Plates
Misc. Manganese Steel Castings

THE FROG, SWITCH AND
MANUFACTURING COMPANY
Carlisle, Pennsylvania • Established 1881

Enter 222-A on card, page 255

Manufacturers' News

ALTON FRANK DAVIS, vice-president and secretary of the Lincoln Electric Company, Cleveland, Ohio, died May 25. Mr. Davis joined Lincoln Electric upon his graduation from college beginning as a service and salesman and later switched to public relations and advertising. In 1925 he became a director and vice-president of the firm; he was named secretary in 1938.

A. F. Davis

As secretary of the James F. Lincoln Arc Welding Foundation, Mr. Davis edited technical books reported to have had a circulation of 750,000 copies. He established an extensive welding library at Ohio State in 1942, and started the A. F. Davis Welding Awards with the American Welding Society in 1945.

Standard Steel Corporation of Los Angeles, Calif., and Decatur, Ill., held its annual sales and technical meeting during May at Palm Springs, Calif.

Dealers and distributors from the United States, Canada and South America inspected a new *Standard* Model S-E, 5,000-lb. "self-erecting" fully portable asphalt plant that can be set up without the use of a crane.

New dealer appointments announced at the conference are Northern State Contractor Equipment Co., Inc., Hague, N. Y.; and Middle West Construction Equipment Corp., Chicago, Ill.

GILSON
TESTING
SCREEN

SIZE TESTS CRUSHED STONE, GRAVEL, SAND, ALL ROAD AGGREGATES

Makes 2 to 7 separations simultaneously in five minutes or less. Size range: 4-in. to 200-mesh. Sand attachment optional for handling 8-in. sieves.

Write for the GILSON catalog

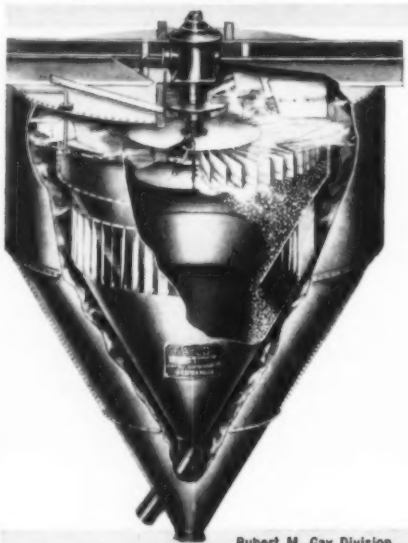
Fill out coupon or clip it to your letterhead.

NAME
COMPANY
ADDRESS

GILSON SCREEN CO.
MALINTA, OHIO

Enter 222-B on card, page 255

USING SCREEN SEPARATIONS?
NOTHING CLASSIFIES AS
PERFECTLY AS AIR



GAYCO
CENTRIFUGAL
AIR
SEPARATORS

Classify practically all dry fine materials

You get:
- CLOSER SEPARATIONS
- IMPROVED PRODUCTION
- NO UNDESIRABLE OVERSIZE.

RANGE 60 to 400 mesh.
Timken bearings.
Choice of Standard or Heavy-Duty Models.

this helpful booklet sent on request

Rubert M. Gay Division
UNIVERSAL ROAD MACHINERY CO.
117 Liberty St., New York 6, N. Y.
Factory and Laboratory: Kingston, N. Y.
In Canada: Watson-Jack Hopkins Ltd., Montreal

Enter 222-C on card, page 255

Diesels work nine to twelve hours daily, get three years between overhauls

Courtney & Plummer does it with Cities Service C-300 Motor Oil.

With four crushing plants, sixty dump trucks, and a host of shovels, cranes, and miscellaneous equipment, Courtney & Plummer still finds it necessary to work nine to twelve hours a day, 5½ days a week to meet its tremendous production schedule.

Clearly, this schedule would be impossible if interrupted by frequent overhauls—but overhauls are few and far between at Courtney & Plummer. In fact, using Cities Service C-300 Motor Oil, diesels are getting three years before overhaul and dump trucks are running as high as 150,000 miles, with long periods of idling.

Even more significant, Courtney & Plummer has discovered it can use Cities Service C-300 Motor Oil in the engines of *all* its various types of diesel and gasolene powered equipment . . . with no need to stock several oils.

If you'd like to simplify *your* motor oil inventory and extend periods between overhaul, too, get the facts about versatile Cities Service C-300 Motor Oil. Talk with a Cities Service Lubrication Specialist, or write: Cities Service Oil Company, Sixty Wall Tower, New York 5, N. Y.

80,000 to 150,000 Miles Between Overhauls is record rolled up by Courtney & Plummer's 60 dump trucks aided by Cities Service C-300 Motor Oil. And mileage tells only half the story, since trucks spend many hours idling as well.

A Million Tons of crushed stone and aggregate a year are produced by Courtney & Plummer, with equipment often in service 12 hours a day to meet the tight schedule. The firm has three portable crushers and one stationary plant.

CITIES SERVICE

QUALITY PETROLEUM PRODUCTS

The only fuel that's sure to give you all 3!

CONSTANT SUPPLY
CONSTANT EFFICIENCY
CONSTANT LOW COST

B&O BITUMINOUS COALS FOR EVERY PURPOSE

Ask our Man! BALTIMORE & OHIO RAILROAD, BALTIMORE 1, MD. Phone LExington 9-0400

Enter 224 on card, page 255

Expansion of the sales staff is responsible for changes in the sales department of the Fibrous Products Division, Union Asbestos and Rubber Company, Bloomington, Illinois.

Heading the list of changes is the appointment of E. W. VIZARD to the new position of midwest regional sales manager. Mr. Vizard formerly served as sales representative in Chicago for the division's Chicago and Kansas City areas. He will transfer to the Fibrous Products Division's headquarters in Bloomington, Illinois.

H. A. SCANDRETT, formerly based in Bloomington, has been moved to Milwaukee to cover northern Illinois, Iowa, Nebraska, North and South Dakota, Minnesota and Wisconsin. W. E. TAYLOR has been moved from Chicago to Cleveland. His new territory will include Michigan, Ohio, the eastern half of Kentucky, and Knoxville, Tennessee.

T. TOMPOROWSKI, formerly with the Division's production department in Bloomington, has been transferred to the sales department and will cover southern Illinois, the eastern half of Missouri, Nashville, Tennessee, and the western half of Kentucky.

A new sales office is being opened in New Orleans to be manned by STEVE GORIN, formerly with the Division's Bloomington office. The New Orleans office will cover portions of Louisiana and Tennessee, plus Mississippi, Alabama, Georgia, and South Carolina. The company reports a second new sales office will soon be opened in Tulsa to serve Oklahoma and portions of Texas and New Mexico.

The appointments of WILLIAM L. CARTER as treasurer, and JAMES H. MEZERA as controller of Harnischfeger Corporation, Milwaukee, Wis., have been announced. Mr. Carter formerly was assistant treasurer, and along with his new position, continues to be secretary and treasurer of both Harnischfeger Export Corp. and Harnischfeger Credit Corp. He has been with the firm seven years. Mr. Mezera, with the corporation for four years, has been acting controller for the past six months.

Enter 225 on card, page 255 →

Modern "One-Hoss Shay"

Remember "The Wonderful One-Hoss Shay"? It ran for 100 years, each part wearing so evenly with the others that all disintegrated at the same instant!

Uniformity of wearing qualities is a key characteristic of Morris Pumps. Witness the worn-out impeller from a Morris Type K pump at right. The vanes are uniformly worn to less than ½" thickness. The suction shroud is completely gone, except for a paper-thin portion little larger than a hand.

Yet the retention of original vane contour maintained hydraulic performance at normal levels, so that only a routine overhaul revealed the extent of overall wear.

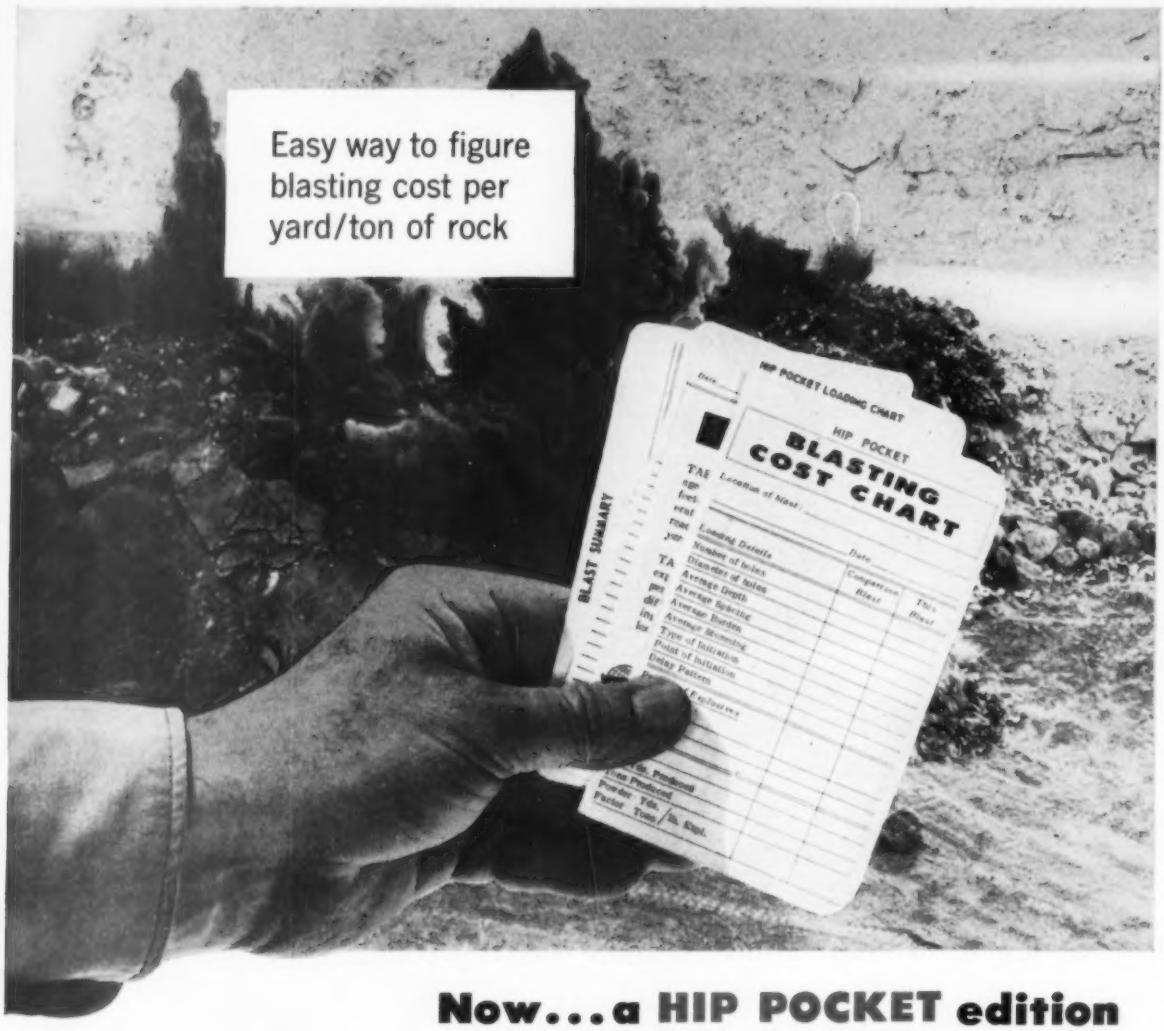
Durability and dependability over the long pull are the *normal achievements* of Morris Pumps. They are the result of proper design backed by superior materials, careful engineering, and fine workmanship.

• Why not call on our engineers for qualified recommendations of pumps you can depend on for years of uninterrupted service.

MORRIS
CENTRIFUGAL PUMPS

MORRIS MACHINE WORKS BALDWINSVILLE, N.Y.

SALES OFFICES IN PRINCIPAL CITIES • EXPORT OFFICE: 50 CHURCH ST., NEW YORK 7, N. Y.


Easy way to figure blasting cost per yard/ton of rock
HIP POCKET LOADING CHART
HIP POCKET
BLASTING COST CHART
BLAST SUMMARY

Now...a HIP POCKET edition of the Atlas BLASTING COST CHART

Here's a new 1959 Atlas Blasting Cost Chart that goes right out on the job with you—helps you record the cost data you need to protect your profits.

The original Blasting Cost Chart, with instruction book and Slide Rule, is being used successfully by hundreds of operators. Now, to make it more convenient, Atlas has added this "hip-pocket" edition. With it you can compare results from blast to blast to determine methods that pay off best. It helps you assemble quick cost facts on drilling, secondary breakage, digging, hauling, and crushing.

Your Atlas representative will be glad to show you how to use the new "hip-pocket" Cost Chart. He has a kit full of information that may help reduce your costs and protect your profits. Ask him for details, or write us direct.

EXPLOSIVES DIVISION
ATLAS POWDER COMPANY
WILMINGTON 99, DELAWARE
Offices in principal cities

Ask your Atlas representative to show you the electric match demonstration . . See why Atlas E. B. Caps lead the field in dependable performance.

Enter 226 on card, page 255

Pit and Quarry

Enter 227 on card, page 255 →

Rear-Dump "Eucs" have payload capacities of 10 to 50 tons—are powered by engines of 132 to 670 total h.p. . . . have loaded speeds up to 41 mph.

For Lower Hauling Costs in Mines and Quarries Check Euclid Performance

Open pit mine and quarries the world over have standardized on Euclid equipment for moving earth, rock, coal and ore on tough off-the-highway hauls. They know from years of experience on their own operations that "Eucs" get more work done every shift—that production cost is lower than with other types and makes of equipment.

Euclid has a complete range of sizes and models to fit every job requirement—rear dump and bottom dump haulers, self-powered scrapers and the world's most powerful crawler tractor. Your Euclid dealer will be glad to provide a production-cost estimate on your present or planned operations—be sure to see him before you replace or add to your equipment fleet—and have him show you why Euclids are your best investment.

EUCLID Division of General Motors Corporation
Cleveland 17, Ohio

Bottom-Dumps carry 13, 17 and 25 cu. yds. struck . . . special coal hauler trailers have capacities of 25, 40 and 51 tons. Full length, unobstructed door opening make these "Eucs" ideal for dumping free-flowing material into drive-over hoppers.

The TC-12 Crawler has 2 engines and independent track drive . . . 425 net h.p. . . . full power shift . . . top speed of 7.8 mph. This "Euc" tractor has unequalled work-ability for heavy dozing, ripping and similar work in mines and quarries.

This "Twin" Scraper has 2 engines with Torqmatic Drive . . . all wheel drive permits self-loading . . . struck capacity is 24 cu. yds. There are six other Euclid Scrapers, overhung engine and six wheel types, with struck capacities ranging from 7 to 24 yds.—9 to 32 yds. heaped.

GM GENERAL MOTORS EUCLID

EUCLID EQUIPMENT

FOR MOVING EARTH, ROCK, COAL AND ORE

Only Gardner-Denver offers 6 crawler drills for your choice

Swing Boom "Air Trac"® (Model ATD3000)—drills more holes from one position . . . reaches out to 2½′ on both sides of track for a total reach from side to side of 11′10″ with boom at 45° elevation . . . drills horizontal holes to 9′6″ above ground level. Like all "Air Trac" models, it is self-equalizing, self-stabilizing . . . moves safely, easily over rough terrain.

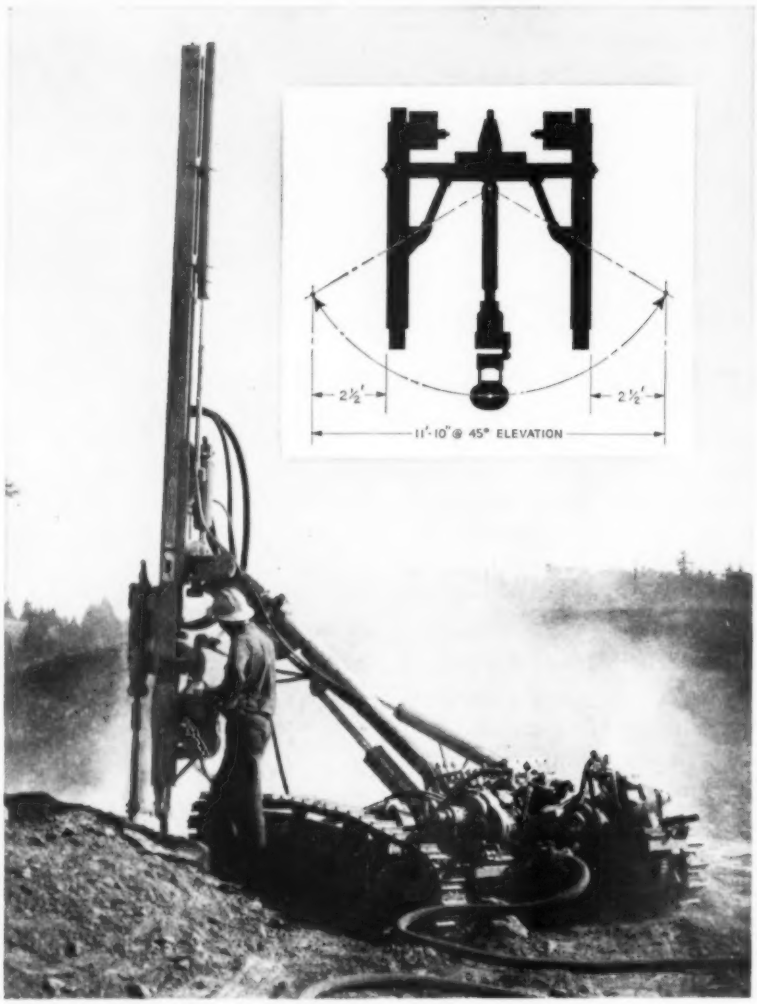
"Air Trac" (Model AT)—the first crawler drill . . . the carrier that made the wagon drill obsolete . . . still the only rig designed to level itself when riding over rough, rocky ground.

Model AT50—"Air Trac" with hydraulic drill positioner and hydraulic remote controls.

Model AT1000—with longer tracks and heavy-duty traction air motors for greater stability in severe terrain.

Model AT1500—like AT1000, has longer tracks and greater traction power. Designed for complete power positioning with hydraulic drill positioner and hydraulic remote controls.

Model HT-143—biggest and most powerful crawler drill available . . . carries the hard-hitting Gardner-Denver 5½″ drill.



Plus . . . the most complete line of field-proved drifter drills available . . . and quality, longer lasting Gardner-Denver sectional drill rods, couplings, and ring seal shanks.

Write for bulletin.

SETTING THE PACE

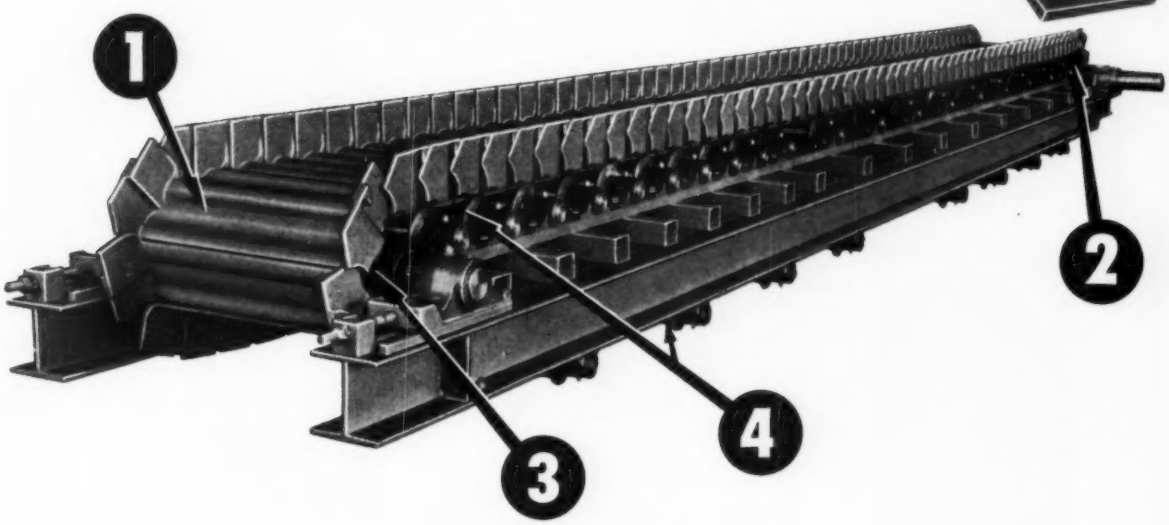
The trend to crawler drills in recent years was pioneered by forward-looking engineers and construction specialists who developed the Gardner-Denver "Air Trac," another example of Gardner-Denver's 100-year philosophy of growth—*there's no substitute for men.*

EQUIPMENT TODAY FOR THE CHALLENGE OF TOMORROW

GARDNER - DENVER

Gardner-Denver Company, Quincy, Illinois
In Canada: Gardner-Denver Company (Canada), Ltd., 14 Curity Avenue, Toronto 16, Ontario

WHERE WEAR COUNTS!



TISCO® PAN FEEDERS

1 FEEDER PANS — Hammered by tons of heavy rocks and ore every minute, but tough TISCO Manganese Chrome Steel pans lick impact and abrasion, outwear ordinary pan feeders 5 to 1.

2 HEAD SPROCKETS — One break-down here flattens production. For dependable durability Manganese Steel does the job.

3 IDLERS — Manganese Steel in this vital part keeps idlers busy, smooth running.

4 ROLLERS — When each roller must continually shake off shocks and abrasion nothing wears like Manganese Steel.

Picture tons of heavy, abrasive material smashing down on this TAYLOR-WHARTON Pan Feeder, month after month without a breakdown. The reason — tough TISCO Manganese Steel soaks up shock and abrasion, keeps production climbing, maintenance down. For further information write to:

TAYLOR-WHARTON CO.

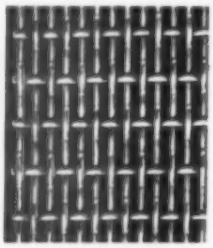
DIVISION OF HARSCO CORPORATION

Established 1742

HIGH BRIDGE 3, NEW JERSEY

PLANTS: Cincinnati, O. — Birmingham, Ala. — Easton, Pa.
SALES OFFICES: New York — Chicago — San Francisco

When you order screens, be sure to specify the type which best meets your requirements. For example:



For maximum through capacity, CF&I Space Screens with rectangular openings are recommended. The high percentage of open area provides considerable freedom from blinding or clogging.

For maximum freedom from blinding or clogging, CF&I Long Slot Space Screens are the most efficient construction. Because of the open area and intense vibration of wires on the long sides of the openings, material can not cling or build up.

* * *

Whatever your screening operation, our engineers will be glad to help you select the optimum screen for your needs.

The Image of CF&I offers

SPACE SCREENS

for less downtime . . . long screen life . . . accurate screening

Symbol for the dependability of all CF&I steel products, the giant steelman can be relied on for tough, precision space screens.

CF&I Space Screens are ideal for rugged screening operations because they are made from quality steel, and are available in a wide selection of types, weaves, crimps and edge preparations. They give long service and, consequently, fewer work stoppages and greater tonnage output for your screen dollars. CF&I Space Screens are tightly woven on hydraulic looms to retain uniform spacing and openings, thus assuring accuracy under the most demanding screening conditions.

When you need a space screen that will stand up under the most severe abrasion and vibration, specify either Super Tempered Screens, made from a special oil-quenched wire, or Wisscoloy Screens, made from a special alloy steel wire.

For engineering assistance in choosing the right space screen for your operation, contact our nearest sales office.

CF&I SPACE SCREENS

THE COLORADO FUEL AND IRON CORPORATION

CF&I STEEL

In the West: **THE COLORADO FUEL AND IRON CORPORATION**—Albuquerque • Amarillo • Billings • Boise • Butte Denver • El Paso • Farmington (N. M.) • Ft. Worth • Houston • Lincoln • Los Angeles • Oakland • Oklahoma City Phoenix • Portland • Pueblo • Salt Lake City • San Francisco • San Leandro • Seattle • Spokane • Wichita

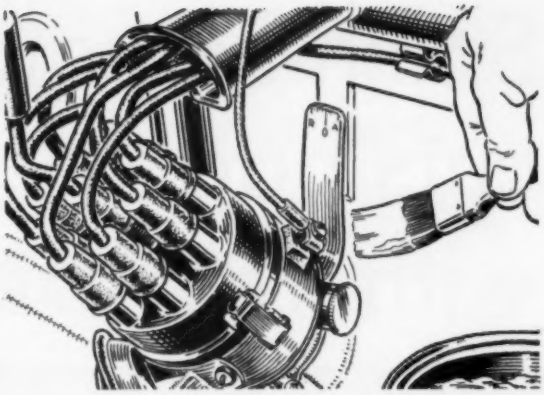
In the East: **WICKWIRE SPENCER STEEL DIVISION**—Atlanta • Boston • Buffalo • Chicago • Detroit • New Orleans New York • Philadelphia

CF&I OFFICE IN CANADA: Montreal

CANADIAN REPRESENTATIVES AT: Calgary • Edmonton • Vancouver • Winnipeg 6924

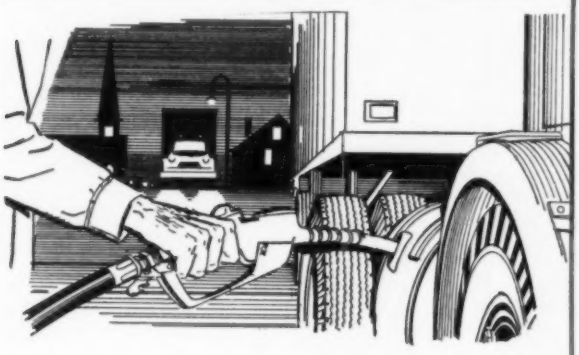
LUBE LOGIC

These sure-money "SLEEPERS" can stop the clock on maintenance time



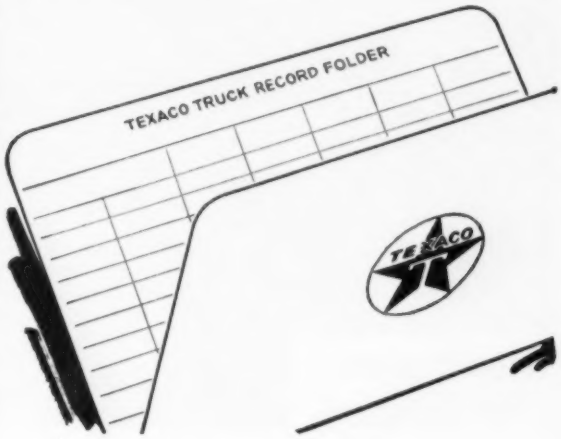
WATERPROOFED IGNITION MAKES STARTING EASIER

Are your batteries showing the strain of a heavy foot on the starter on damp days? Get your TAE* to show you how to waterproof ignitions with Texaco Rust-proof L. It's a simple, five minute job that pays off with months of faster starts.



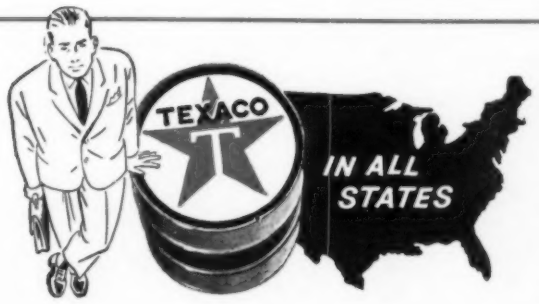
HOW TO KEEP CONDENSATION OUT OF YOUR TANK

Condensation in your fuel tank can make even the best gasoline sound like you were robbed. One way to avoid it is to fill your tank in the evening—when it's cool and the gas has contracted to minimum volume—and *keep* it filled overnight. This cuts down the possibility of condensation by reducing air volume.



TRUCK RECORD FOLDER

Sturdy manila folders designed to help you keep tabs on mileage, oil changes, lubrication, tire life, batteries, etc., is yours for the asking. Tell your TAE* how many you need: or write direct.



*TEXACO AUTOMOTIVE ENGINEERS

Every month or so we'll bring you a batch of "sleepers"—little angles, so easy to overlook, where big savings in time and money can be made. But month in, month out, your local Texaco Automotive Engineer is the best source of money-saving lubrication ideas. Don't forget that "Lubrication is a major factor in cost control." Texaco Inc., 135 East 42nd St., New York 17, N. Y. Dept. **PQ-11.**

Smith-Douglass cuts bag costs with WONDERWALL®

Another major user of multiwall bags, the Smith-Douglass Co., Inc., of Norfolk, Va., has reduced bag costs with WONDERWALL, the tougher, cost-cutting new multiwall.

The Company's nine plants are strategically located in the Southeast, Midwest and Southwest, producing substantial quantities of fertilizer, nitrogen and P_2O_5, the latter for use as a phosphorus feed supplement as well as for mixed fertilizer.

"Because the WONDERWALL is so much tougher," states James A. Monroe, (pictured above) Vice President in charge of Operations, "we were able to lower our multiwall bag paper basis weight by 30 lbs.—from 220# to 190#, and secure a saving of $3.50 per thousand. Breakage was reduced, too."

The WONDERWALL is made with Kraftsman Clupak* paper. Its patented, built-in stretch resists impact and greatly increases toughness.

See how the tougher, stronger WONDERWALL can cut *your* bag costs—and reduce bag breakage, too. Just write Multiwall Bag Division, West Virginia Pulp and Paper Company, 230 Park Avenue, New York 17, N. Y.

**Clupak, Inc.'s trademark for extensible paper, manufactured under its authority.*

West Virginia Pulp and Paper

Meet tough "Specs" at LOWEST COST!

Remove wood, ochre, chert, lignite, shale, coal, soft and porous stone, and non-plastic type clay from aggregates at the lowest initial and operating cost available, with the Meckum Sand & Gravel Jig.

The Meckum Jigs' high acceptability and performance is proven as the jigged aggregates meet increasingly rigid 'specs' with ease, enabling you to obtain new contracts and greater profits. With amazing simplicity and low cost of operation, Meckum Jigs produce premium quality concrete aggregates for only a few pennies per ton.

More Meckum Sand & Gravel Jigs have been installed, than any other method of removing deleterious materials from aggregate. Don't delay, be prepared. Find out how a Meckum Jig can benefit you.

Upon receipt of a 25 pound representative sample of the material to be jigged, we will make our recommendations based on the lab test results.

Write us for details

MECKUM ENGINEERING, INC.
Dayton Road
Ottawa, Illinois

Please send me full information on the Meckum Sand and Gravel Jig, and how I may meet 'specs' at lowest cost. ☐ I am mailing a 25 pound representative sample for analysis.

NAME_____

COMPANY_____

ADDRESS_____

CITY_____ ZONE____ STATE_____

J2 PQ

MECKUM ENGINEERING, INC.

Dayton Road
Ottawa, Illinois

53 W. Jackson Blvd.
Chicago 4, Illinois

Enter 234 on card, page 255

FREDERICK B. SHEW has been appointed manager of sales, commercial cranes and excavators, by Bucyrus-Erie Co., South Milwaukee, Wis.

Mr. Shew had been sales development manager, commercial cranes and excavators, for the last three months. He joined the Company in 1956 as a sales representative following a six-year association with the Wellman Engineering Co., Cleveland, Ohio.

F. B. Shew

J. V. Wright

Dorsey Trailers, Elba, Alabama, has been purchased by the Dorsey Corporation of New York City. Management personnel of Dorsey Trailers will remain and the former owners of Dorsey Trailers are reported to have purchased a substantial interest in the new company. J. V. WRIGHT, will continue as president of Dorsey Trailers, and has been made a vice-president of the Dorsey Corporation.

In addition to its complete line of commercial and heavy duty trailers, Dorsey products include truck bodies and self-unloading bodies and trailers for hauling bulk materials.

R. C. CONOVER, has been appointed Western District works manager, Refractories Division, H. K. Porter Company, Inc. Mr. Conover will supervise operations of Western District plants which include Laclede and Christy, in St. Louis, Mo.; Bessemer, Ala.; Ottawa, Ill.; and Canon City, Colo.

Vickers Incorporated, Division of Sperry Rand Corporation, has appointed CHESTER LENIK as district manager of the Tulsa office, where he will be responsible for the sales and service of Mobile Division products. Mr. Lenik has been with Vickers for eight years . . . the last four as an application engineer in the Minneapolis office.

FARRELL-CHEEK

ELEVATING and CONVEYING PARTS

. . . for Outstanding Performance Under the Most Severe Conditions

F85 EC

F85 ALLOY, HARD EDGE AND CARBON ELECTRIC FURNACE STEEL CASTINGS

WRITE TODAY FOR CATALOGS NOS. 21 and 23

FARRELL-CHEEK STEEL COMPANY
SANDUSKY, OHIO, U. S. A.

BUCKETS • SPROCKETS • CHAIN • WHEELS • GEARS • SHEAVES • CABLE FITTINGS • BAR BENDERS, CUTTERS • R. R. CASTINGS • FIRE TOOLS, ETC.

Enter 235-A on card, page 255

STARSTEEL
HEAVY DUTY **SPACE SCREENS**

Tough, rugged STARSTEEL Screens give up to double the service life of ordinary replacements—save up to half your screen costs!

Specially alloyed STARSTEEL high-carbon wire shows amazing resistance to abrasion and fatigue—rigid, accurate weaving prevents buckling and distortion—absolutely square precision-applied hook strips make installation easier, insure tighter, uniform surface tension that means longer wear under the most punishing operating conditions.

Take ALL the guesswork out of screen buying—*order STARSTEEL.* Prices are sharply competitive.

Fast Shipment from stock on most weaves and sizes.

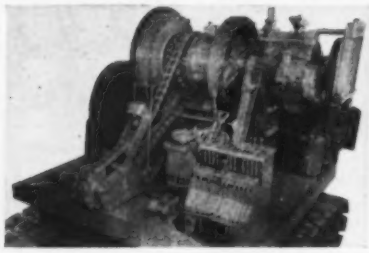
Star will produce screens or cloth from stainless or other steel alloys, Monel, brass, bronze, copper, aluminum or any metal that can be drawn into wire. Inquiries invited.

STAR WIRE SCREEN & IRON WORKS, INC.
2515 San Fernando Road • Los Angeles 65, Calif.
Subsidiary of Ludlow-Saylor Wire Cloth Company, St. Louis, Mo.

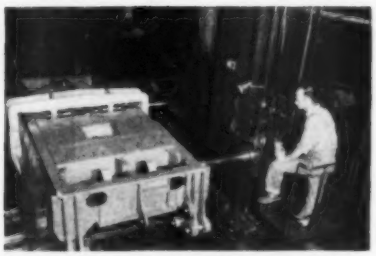
Enter 235-B on card, page 255

Six reasons why Link-Belt Speeder . . .

1. SPLIT-SECOND FINGERTIP CONTROL — Exclusive Speed-o-Matic power hydraulic controls put a K model through its paces at a flick of an operator's wrist . . . minimize fatigue . . . encourage high production throughout the shift.



2. BONUS USABLE HORSEPOWER — The extra strength built into load-carrying components permits K models to take full advantage of the engine's available horsepower and still remain well within engine manufacturers' recommended speeds.



3. PRECISION ALIGNMENT TO CUT MAINTENANCE — Close-tolerance machining, including jig line boring (above), means closer fits . . . less chance for eventual misalignment . . . no need for shims . . . better parts interchangeability.

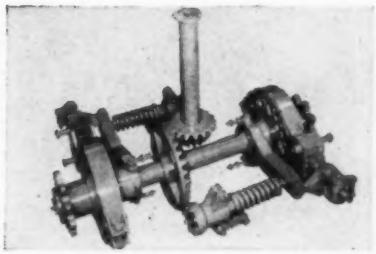
King-size K models

Here's how the 1¾-yard K-370 Series is tailored to today's economy . . . why it's a better buy than any 1½-yard shovel-crane . . . more practical to use than many 2-yard rigs

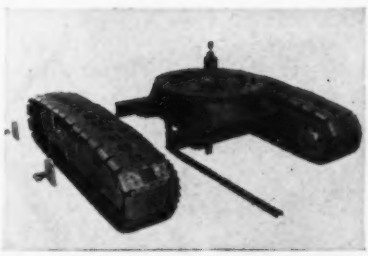
In comparison with 1½-yard machines, the 1¾-yard K-370 offers much more than just a 16% advantage in bucket capacity. It's fast, easier handling . . . exceptionally maneuverable and easy to transport. It boasts the top usable horsepower in its class . . . even outrates some 2-yard rigs.

For the complete story, see your distributor or write for the new 20-page catalog, No. 2727.

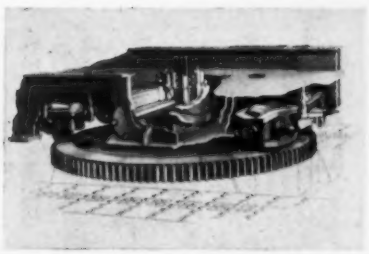
LINK-BELT SPEEDER CORP., CEDAR RAPIDS, IA.



4. EXCEPTIONAL ON-THE-JOB MANEUVERABILITY—Traction mechanism features hydraulic power steer. This, plus high speed power shifting, makes K models great for work in tight quarters. No time wasted to manually engage jaw clutches.



5. EASY JOB-TO-JOB TRANSPORTABILITY—Any K model can be readied for lowboy or rail car transport in short order. Crawler side frames, counterweight and attachments can be removed to meet weight or width restrictions.



6. NO BINDING STRESSES ON CENTERPIN OR ROLLERS—Exclusive centerpin trunnion and oscillating conical roller design eliminates concentrated centerpin loadings . . . prevents shearing or bending . . . minimizes wear.

deliver bonus output

And here's why the 3-yard K-608 series outmaneuvers smaller rigs . . . often outproduces bigger machines

The K-608 has created real excitement wherever it has been used. It's so fast, so easy to handle, so powerful!

And no wonder—with Speed-o-Matic controls, power shift, power steer and many other features, the K-608 wheels through cycles at a speed you'd expect only from smaller rigs. The K-608 features an engine-torque converter and tailshaft output governor combination as standard equipment. The result—ability of engine power to adapt to load requirements . . . no chance for engine stalls.

For all the facts, see your distributor or write for the new 20-page catalog, No. 2710. 14,900

LINK-BELT SPEEDER

It's time to compare . . . with a Link-Belt Speeder

Enter 236 on card, page 255

Bearings...

Oil... and How to Save Money

The longer your engines run before need of overhaul—the less your cost of operation. Sinclair Tenol® Motor Oils have earned the reputation not only for giving long bearing life, but also for resisting the formation of harmful carbon deposits. Tenol Oils slash down-time and maintenance costs. Next time management asks how you've cut costs, tell them you've switched to Sinclair Tenol—and show them the results.

Call your **Sinclair Representative** for further information or write for free literature to Sinclair Refining Company, Technical Service Division, 600 Fifth Avenue, New York 20, N. Y. There's no obligation.

Sinclair

Sinclair
Tenol® Motor Oils

UNSTICK *stuck* BINS

with new
electro-permanent magnetic
ERIEZ
HI-VI
BIN VIBRATORS

PAT. PEND.

Here's the newest and most efficient answer to those hard-to-move materials in sticky bins . . . designed to provide superior operating efficiency . . . exclusive pinpointed vibration gets right to the trouble spot – starts stubborn materials moving!

NO RECTIFIER NEEDED • COMPLETELY ENCLOSED HOUSING • GREATER VIBRATION IMPACT THAN COMPARABLE SIZE UNITS • RUGGED AND DURABLE • LOW FIRST COST • LOW OPERATING AND MAINTENANCE COST

Special Mill Mutual ACCEPTED Units for HAZARDOUS DUSTY LOCATIONS

GET BIG CATALOG . . . WRITE TODAY
Eriez Mfg. Co., 113-UA Magnet Dr., Erie, Pa.

ERIEZ

Enter 239-A on card, page 255

Appointment of JAMES H. COOVER to the newly-created office of executive vice president has been announced by the D-A Lubricant Company, Inc., Indianapolis, Ind., manufacturer of lubricants for heavy-duty construction machines.

Mr. Coover joined the Company in 1943 as Chief Chemist. He is a member of the board of directors of the firm and prior to his new office was vice-president, production and research.

J. H. Coover

J. G. Hanna

Vickers Incorporated, a division of the Sperry Rand Corporation, has appointed JAMES G. HANNA, West Coast Regional Sales Manager, Mobile Hydraulics Division. Regional headquarters will be located at the Vickers El Segundo, California plant. Mr. Hanna will supervise mobile hydraulics sales activities of the El Segundo and Berkeley, Calif., and Portland, Ore. district offices. These cover ten states in the West Coast and Rocky Mountain areas.

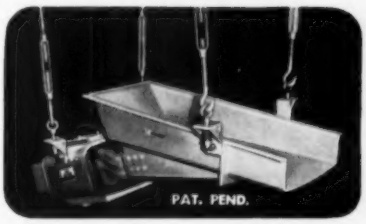
Streeter-Amet Company, Grayslake, Ill., has added to its line of electronic weighing and counting equipment, *Ametron Instruments*, through the purchase of Electro Way Systems from Bell Aircraft Corporation, Buffalo, N. Y.

Electro Way is an electronic continuous weighing system for application to conveyors with a 14″ to 72″ belt. It measures the belt speed and the weight of material on a section of the conveyor belt, and multiplies these two variables to obtain the total weight or flow weight of material conveyed.

To be known as Bell Electro Way Division of Streeter-Amet Company, it is reported that all of the new division will be moved from Rochester, N. Y., to Streeter-Amet at Grayslake, Ill.

FEEDER OF THE *future* HERE NOW!

electro-permanent magnetic
ERIEZ
HI-VI
VIBRATORY
FEEDER



Award-winning feeder . . . features new concepts in design and use of materials. Priced right; provides superior performance; lower operating costs; reduced maintenance and greater production output! For *automatic*, accurate feeding of all types of bulk materials. Variable feed rate from ounces to tons . . . performs spreading, aerating, cooling, proportioning, screening, other operations.

NEW A.C. ELECTRO-PERMANENT MAGNETIC DRIVE PROVIDES GREATER FEEDING CAPACITY • NO RECTIFIER NEEDED • FULLY ENCLOSED POWER ELEMENT PROTECTED AGAINST DUST AND MOISTURE • RUGGED GLASS FIBER SPRINGS REDUCE BREAKAGE • FULLY PROVED IN PLANTS EVERYWHERE

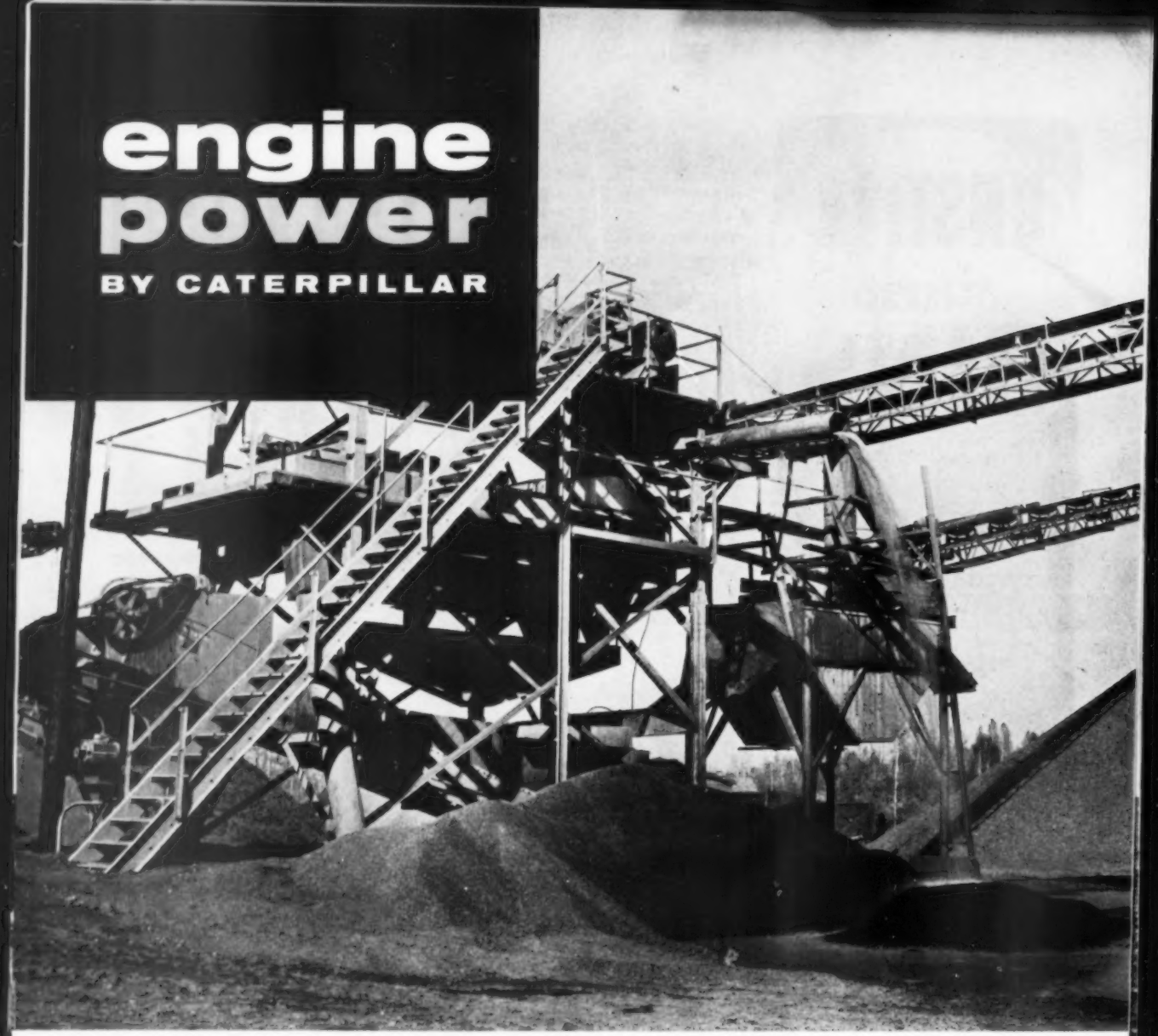
ALSO AVAILABLE: Economical, specially constructed units for hazardous, dusty locations . . . fully acceptable by Mill Mutual.

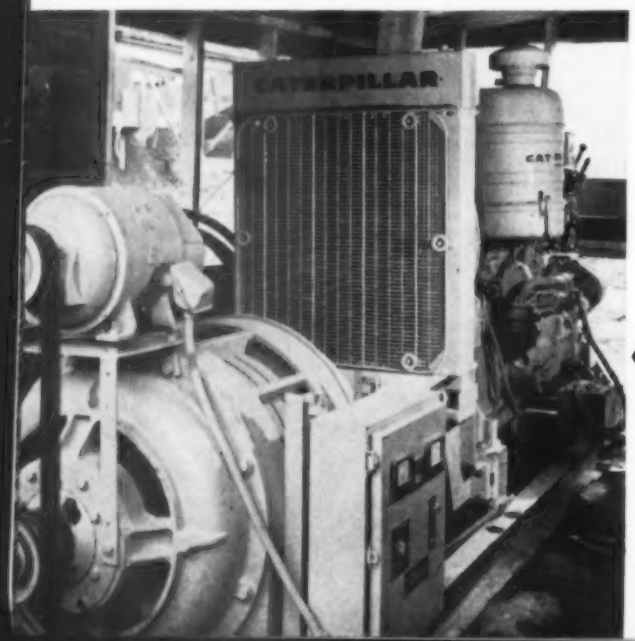
WRITE FOR BIG VIBRATORY FACT FILE
Eriez Mfg. Co., 113-UB Magnet Dr., Erie, Pa.

ERIEZ

Enter 239-B on card, page 255

engine power
BY CATERPILLAR

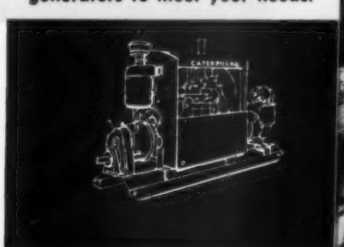




Arrowhead Sand and Gravel replaced three diesels and one gas engine with this Cat D353 "Two-Handed" Diesel with belt pulley drive. The 1-for-4 substitution increased production of washed material from 85-90 yd. per hour to 120-125 yd. per hour. Arrowhead is one of the largest aggregate plants in the Duluth-Arrowhead regions of Minnesota. The Cat "Two-Handed" Engine provides direct power for an 18 x 36 inch Universal jaw crusher, a 24 x 42 inch Pioneer roll crusher, electrical power for ten motors from 1 to 60 HP, including a 60 HP motor on a Cedarapids 100 x 42 inch scalping screen. In addition, this power package supplies current for plant lighting.

This is all the room Arrowhead Sand and Gravel needs for the Cat D353 "Two-Handed" Set. You don't need any elaborate shelter with Caterpillar Engines because air, fuel and lube oil are all filtered to keep microscopic abrasive particles from getting into engine. 100% filter protection is standard—at no extra cost . . . provides longer, trouble-free life, cuts down time.

Nine basic Cat "Two-Handed" Engines range in size from the 650 HP (maximum output rating) D397 to the 75 HP D311 (Series H) . . . are matched with generators to meet your needs.



How one Cat "Two-Handed" Diesel replaced four engines

"When an engine can run the entire plant with direct drive from one end and power a large generator from the other, the engine must have built-in mechanical and engineering superiority."

—Con Robertson, President
Arrowhead Sand and Gravel
Duluth, Minnesota

Four engines were at work on Con Robertson's washing plant near Duluth. Performance and production were limited by lack of power on the primary crushers. The obvious answer was to put a larger engine on this vital jaw and roll combination.

Instead, Arrowhead installed just *one* Cat D353 "Two-Handed" Engine to replace three diesels and a gas engine. Production rose by 40 yards per hour. Efficiency went up when the power source was concentrated in one package.

There are *nine* basic Cat Engines capable of transmitting 100% power off either end of the crankshaft. They can be matched with clutch, transmission and generator to exactly match your plant mechanical-electrical requirements. The transmission or clutch can drive jaw and drum crushers through simple, direct connections. Electrical power from the generator can allow better control of screens and belts for an even flow of material.

Cat "Two-Handed" units are compact and portable. You can mount them easily on trucks away from dust and vibration. Their fast governor response makes them a natural for crusher jobs.

You can save money by taking power off both ends of a single crankshaft. Call your Caterpillar Dealer today to receive the advantages of a Cat "Two-Handed" Engine installation on your job.

Engine Division, Caterpillar Tractor Co., Peoria, Illinois, U. S. A.

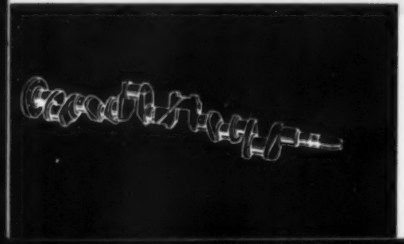
Caterpillar and Cat are Registered Trademarks of Caterpillar Tractor Co.

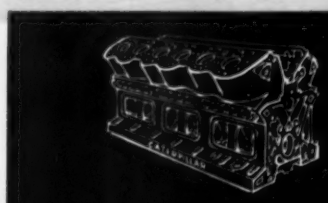
For further information send for booklet, "Now for Top Crusher Production"

Cat Crankshafts are made from pre-tested steel drop-forgings, with journal surfaces "Hi-Electro" hardened to *last*. Rifle-drilled crankshafts carry oil under pressure from journals to crank pins and bearings.

Your Caterpillar Dealer Engine Specialist is your diesel power consultant. He's backed by quality parts, reasonably priced, and a skilled staff of factory-trained servicemen. Call him now to avoid problems later.

Caterpillar's own foundry casts engine blocks of a special high-tensile strength alloy, 50% stronger than ordinary gray iron castings. Further rigidity and strength are provided by numerous ribs and partitions.





message on
POWER VALUE

for buyers of . . . Hoists Compressors • Pumps • Generators • Graders • Stabilizers • Crushers • Excavators Rollers • Loaders

To improve performance and lower operating cost, insist on P&H Diesel power for all of your NEW construction equipment and REPOWERING needs.

- **The rugged, heavy-duty P&H Diesel with extra torque never falters—supplies reserve power to pull through when the going gets rough.**
- **Highly efficient P&H Diesel delivers more power with less low-cost No. 2 fuel oil.**
- **Morning starts and cold weather are no problems—P&H Diesels kick right over.**
- **P&H fuel system is tailor-made for construction equipment—P&H Diesels idle for hours without fouling.**
- **2-cycle P&H design minimizes power losses in altitude operation.**

Compact, simplified P&H Diesel design results in easier maintenance—25% fewer parts, with all fittings easy to get at. All wearing parts are interchangeable. P&H Diesels in 2, 3, 4 and 6-cylinder models range from 40 to 320 h.p. See your P&H distributor, or write Dept. 412A, P&H Diesel Engine Division, Harnischfeger Corporation, Crystal Lake, Illinois.

P&H DIESEL

HARNISCHFEGER
P&H • Diesel Engine Division
Crystal Lake, Illinois

Enter 242-A on card, page 255

• Cummins Engine Company, Inc., Columbus, Ind., had its one millionth "V" horsepower go into service in a Michigan 480 tractor-dozer delivered to M. M. Sundt Construction Company, Tucson, Ariz. The engine is a 600 hp. Cummins VT-12 Turbodiesel. Taking part in the delivery were (left to right): C. J. Wilhite, manager construction sales for Cummins Engine; John S. Sundt, president of Sundt Construction; and Paul O. Miller, president of Cummins Arizona Diesel, Phoenix, Ariz.

The Ambric Testing and Engineering Associates, Inc., announce the opening of their new testing laboratories in Philadelphia, Pa.

The new laboratories, occupying over 9000 sq. ft. of floor space, are equipped and staffed to perform physical tests and chemical analyses of structural and mechanical materials. These include concrete, steel, masonry materials, soils, paints, fuels and bituminous materials.

Working in conjunction with the laboratories is a staff of experienced field engineers engaged in the inspection and quality control of materials.

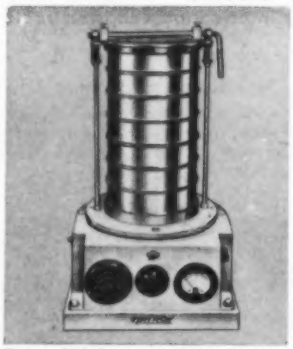
The laboratories are directed by HAROLD M. CARSON, president; DONALD D. MEISEL, chief engineer; and LEWIS G. BRICKER, chief chemist, who for many years have been engaged as consultants in this field.

FRANK C. STEIMKE, previously research director for Walsh Refractories Corporation, St. Louis, has been promoted to vice-president in charge of manufacturing and research. He has been with the company for 18 years.

Mr. Steimke's experience includes research and development in fire clay brick, cements, castables, coatings and plastics at the company's Vandalia works, as well as extensive activity in the field of glass house refractory materials. His efforts of late have been largely devoted to pioneer work in the research and development of the company's new fusion cast and zircon refractories.

CRAIG E. DAVIS has been appointed project engineer for Raymond Bag Corporation, Middletown, Ohio.

The **NEW** double action *SYNTRON* VIBRATING
TEST SIEVE SHAKERS
produce uniform, dependable analyses, faster



SYNTRON'S New Electromagnetic Sieve Shakers provide a double action—both vertical and rotating— for faster, more accurate analysis.
They are easy to operate and the absence of mechanical wearing parts assures dependability and low maintenance

SYNTRON TEST SIEVE SHAKERS FEATURE:
- Double action electromagnetic drive—3600 controllable vibrations per minute.
- Rheostat voltage control
- Reset timer for accurate time testing

Each SNYTRON Test Sieve Shaker will accomodate up to 6 standard 8 inch test sieves and bottom pan.
Operation from 115 volt, 60 cycle a-c (230 volt to order)

Write for free Illustrated brochure

SYNTRON CO.
385 Carson Ave. Homer City, Pa.

Enter 242-B on card, page 255

STUART A. CURRIE has been named contractor service manager of the explosives and mining chemicals department of American Cyanamid Company, New York, N. Y.

Formerly district manager for the Pennsylvania-Maryland area, Mr. Currie will be responsible for nationwide coordination of marketing to the construction industry. His headquarters will be in Latrobe, Pennsylvania. He joined the technical section of Cyanamid's explosives department in 1937.

S. A. Currie

R. Carder

ROBERT CARDER has been appointed vice-president of Hensley Equipment Company, Incorporated, San Leandro, Calif. Mr. Carder joined the firm two years ago as office manager of the San Leandro branch.

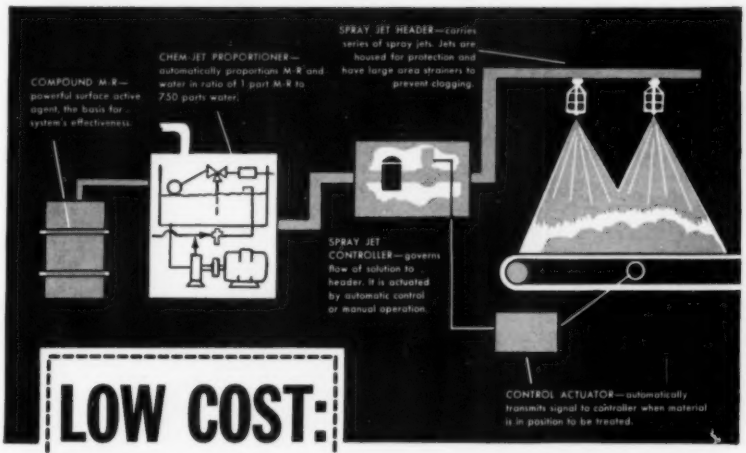
New distributors have been appointed to sell and service the *Michigan* line of Construction Machinery Division, Clark Equipment Company, Benton Harbor, Mich.

Road Equipment Company, Inc., New Orleans, La., has been appointed the "Michigan" distributor for parishes in Louisiana south of and including Beauregard.

With the appointment of this new distribution in Louisiana, Clark announced a change in territory for White Oil & Equipment Company, Inc., Bossier City, La. White Oil will now sell and service *Michigan* construction machinery in all parishes north of and including Vernon, Rapide, and Avoyelles.

The Bode-Finn Company, Cincinnati, Ohio, with a branch office at Dayton, Ohio, will sell and service *Michigan* machines in 24 Ohio counties. The Gibson-Stewart Company, Cleveland, Ohio, with branch offices at Columbus and Toledo will handle the line in a major portion of central Ohio.

JOHNSON MARCH chem-jet DUST CONTROL SYSTEM


SPRAY JET HEADER—carries series of spray jets. Jets are housed for protection and have large area strainers to prevent clogging.
CHEM-JET PROPORTIONER—automatically proportions M-R and water in ratio of 1 part M-R to 750 parts water.
COMPOUND M-R—powerful surface active agent, the basis for system's effectiveness.
SPRAY JET CONTROLLER—governs flow of solution to header. It is actuated by automatic control or manual operation.
CONTROL ACTUATOR—automatically transmits signal to controller when material is in position to be treated.

LOW COST:
Investment
Operation
Maintenance

typical users of Chem-jet Dust Control Systems:

- General Crushed Stone Co.
- Lambert Brothers Quarries
- Marquette Cement Co.
- Nello-Teer Co.
- Penn-Dixie Cement Co.

THIS is what makes Chem-jet Dust Control different from any other system:

Chem-jet solves your dust problem by preventing dust! It attacks dust at its source, allaying dust before it becomes airborne.

Chem-jet treats dust bearing materials with Compound M-R, an extremely powerful surface active agent developed by Johnson-March chemists. M-R confines and agglomerates dust, with as little as ½ to 1% moisture per ton of material.

Chem-jet saves you money through low cost installation, minimum maintenance, economical operation. It eliminates bulky hoods, ducts, fans, plus the extra trouble of collecting and disposing of dust.

Where dust is a community nuisance and an employee hazard, it will pay you to investigate low cost Chem-jet. Write today for Booklet CJ-1 to Johnson-March, 1724 Chestnut St., Philadelphia 3, Pa.

JOHNSON MARCH
DUST CONTROL ENGINEERS
1724 Chestnut Street, Philadelphia 3, Pa.

Enter 243 on card, page 255

USS Tiger Brand Amerclad Cables are built tough and strong to withstand dragging over sharp rocks, and exposure to sun, rain, grease and oil.

Right—Strength and flexibility of Amerclad are shown by its use over this cable bridge leading to a power shovel.

Far right—Vibration resistance of the Amerclad Cable is the main reason for its use on this railroad track tamping machine.

USS

Tiger Brand Electrical Wire & Cable

A standard cable for every special job

- Asbestos Wire and Cable
- Mold-Cured Portable Cord
- Shovel & Dredge Cable
- Paper & Lead Cable
- Varnished Cambric Cable
- Interlocked Armor Cable
- Special Purpose Wire & Cable
- Aerial, Underground and Submarine Cable

What's the difference in electrical wire and cable?

Even though electrical cables may look alike and start with some of the same materials, there's a *real difference* in the completed cables.

The difference in USS Tiger Brand Amerclad Cables results from a combination of research, engineering and construction. The development of better materials goes on constantly at American Steel & Wire. Insulation and jacketing compounds have been improved.

Better stranding designs and methods of stranding add years to cable life.

Amerclad Cables are protected by an outer jacket of Amerprene, an oil resistant compound containing a high percentage of Neoprene. Before being vulcanized, an Amerclad Cable is encased in a substantial lead sheath that is afterward removed. The pressure developed within this rigid mold during the vulcanization process produces a dense, non-porous jacket that is highly resistant to abrasive wear.

Knowledge of severe field conditions obtained through sales engineers permits designing for special conditions.

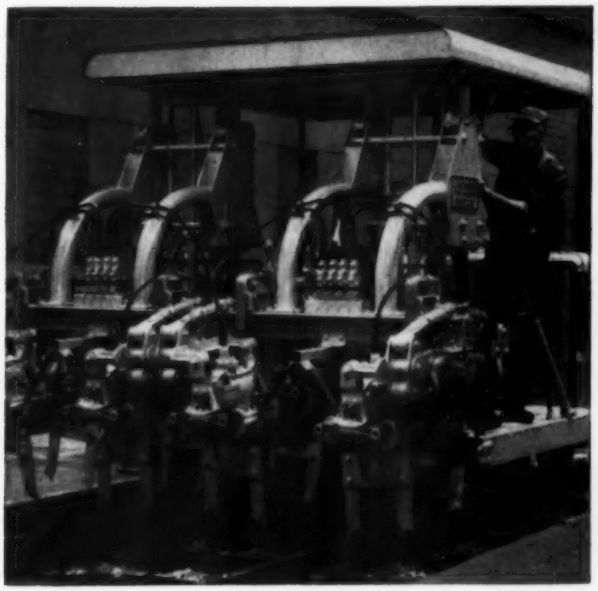
Constant effort to control quality and improved methods of inspection assure a product of highest quality.

These are a few of the unseen plus values you get when you buy Tiger Brand Amerclad Cables for your shovels, dredges, continuous miners, drills, shuttle cars and other equipment. For complete technical information, write for our free book, "Tiger Brand Amerclad Cord Cable," American Steel & Wire, Room 9157, 614 Superior Ave., N.W., Cleveland 13, Ohio.

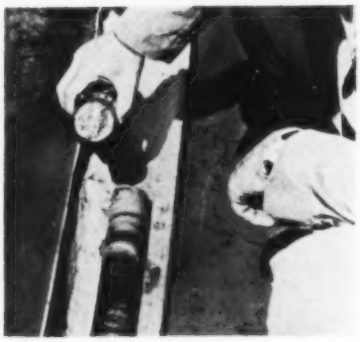
USS, Tiger Brand and Amerclad are registered trademarks

American Steel & Wire Division of United States Steel

Columbia-Geneva Steel Division, San Francisco, Pacific Coast Distributors
Tennessee Coal & Iron Division, Fairfield, Ala., Southern Distributors
United States Steel Export Company, Distributors Abroad



98% CORE RECOVERY IN UNCONSOLIDATED SAND & SILTSTONE!



In the Gas Hills Area of Wyoming, loose sand and siltstone occur in the ore-bearing zone with core recovery averaging about 65%. In our determination to give only the very best, Sprague & Henwood used the "frozen" core technique by which the recovery was increased to 98%.

The value of ore reserves can best be determined by a high percentage of core recovery. Throughout Sprague & Henwood's more than 75 years of service to the industry, we have consistently made every effort to furnish the highest percentage of core possible. Our new contract brochure illustrates our complete drilling service; we would be glad to send you a copy upon request.

If you are planning a program of diamond drilling, from either the surface or from underground, contact Sprague & Henwood, Inc., at our home office in Scranton, Pennsylvania, or at the branch nearest you.

SPRAGUE & HENWOOD, Inc.
SCRANTON 2, PA.

New York—Philadelphia—Atlanta—Pittsburgh—Grand Junction, Colo.—Buchans, Nfld.

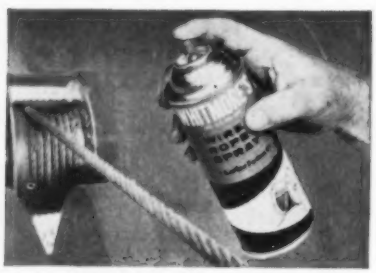
Enter 246-A on card, page 255

TRIAL SAMPLES

Of World-Famous WHITMORE'S Lubricants NOW IN AEROSOL SPRAY-ON CANS!

HANDI-LUBE LIQUID GEAR COMPOSITION

For open gears, sliding surfaces—exclusive formulas eliminate metal to metal contact, keep wear on the lubricant not the metal—no breakdown even after prolonged use under water—available for every climatic condition—packaged in handy 16-oz. aerosol spray-on containers or in bulk containers—send for a free trial sample.



WIRE ROPE SPRAY LUBRICANT

Exclusive formulas for lubricating and protecting wire rope, chain, springs. Penetrates to the core of wire rope minimizing internal friction and increasing usable life up to 300%—special protective qualities absolutely eliminate corrosion—non-gumming qualities reduce "carry-back"—packaged in handy 16 oz. aerosol spray-on containers or in bulk containers—send for a free trial sample.

65 YEARS OF LEADERSHIP LUBRICATING THE FOLLOWING:

- Open Gears, Dipper Sticks, Cams
- Enclosed Gear Cases
- Wire Rope and Cable
- Hydraulic Units, Torque Converters
- Roller, Ball, and Sleeve Bearings
- Speed Reducers

Est. 1893
THE WHITMORE MANUFACTURING CO.
LUBRICATING ENGINEERS
CLEVELAND 4, OHIO, U.S.A. PHONE: VULCAN 3-7272

Enter 246-B on card, page 255

The appointment of ROBERT J. EHRHART to the sales engineering staff of Simplicity Engineering Company, Durand, Michigan, has been announced. Mr. Ehrhart has served on the Parts and Service staff of the Buick Motor Division since July, 1957. After a training period in the Simplicity home office, he will be assigned to the Philadelphia-Baltimore area.

R. J. Ehrhart

A. J. Jorgensen

Three new appointments have been announced by Allis-Chalmers Processing Machinery department as follows: FRANK E. BRIBER JR., manager of product sales; EUGENE B. COOK, chief engineer; and ARTHUR J. JORGENSEN, consulting mechanical engineer.

Mr. Briber, who joined Allis-Chalmers in 1946 had been engineer-in-charge of crushing, grinding, and minerals processing machinery. Prior to that he was manager of the crusher section.

Mr. Cook had been engineer-in-charge of product engineering in the processing machinery department. Mr. Jorgensen had been chief mechanical engineer since 1946. He had been associated with the processing machinery department since coming with the company in 1912.

Bemis Bros Bag Co., St. Louis, Mo., has announced the election of C. C. HAMMER as treasurer succeeding T. W. LITTLE who retired May 31. Mr. Hammer joined Bemis in December 1958, and was elected assistant treasurer shortly thereafter.

Mr. Little retired after more than 40 years service with Bemis. He joined the company in 1916 as a clerk. In 1946 he was made treasurer. In addition to his duties as treasurer, Mr. Little served as director of the Burlap Department. He will be succeeded in this position by W. D. MCLEAN but will continue as a director of the company.

S. J. Madden

STEPHEN J. MADDEN, of The Babcock & Wilcox Company, New York, N. Y., was elected president of the New York chapter of the National Industrial Advertisers Association at the Association's annual meeting. He will take office July 1 and serve during the 1959-60 Association year. Mr. Madden joined Babcock & Wilcox's advertising department in 1946. He is presently assistant advertising manager with headquarters in New York.

Aeroquip Corporation, Jackson, Mich., has appointed the following distributors: Gilan Auto Supply, Fort Myers, Fla.; Air Cleaner Sales, Inc., St. Paul, Minn.; Joint & Clutch Service, Inc., Indianapolis, Ind.; Johnson Hydraulic Equipment Co., Minneapolis, Minn.; Reliable Rubber Products Co., Dayton, Ohio; Arrow Engine Service, Inc., Milwaukee, Wis.; Eggiman Motors, Madison, Wis.; R. L. Miller Co., Pittsburgh, Pa.; and J. V. Tripoli & Co., Inc., Buffalo, N. Y.

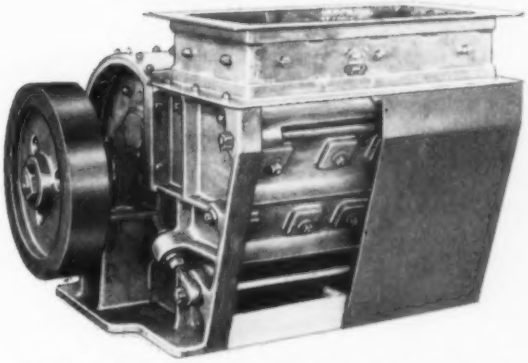
Through its Industrial Products Division, Dayton Rubber Company, Dayton, Ohio, has entered the industrial hose field. The new line will include air, water, steam, suction, and pressure hoses in a full range of sizes and construction.

JACK O. QUAMME has been named to the newly-created post of product manager for the industrial hose line. He has nine years' experience in industrial products sales in the rubber industry.

A. T. JACOBSON has been appointed sales manager of the Patterson Foundry and Machine Company, East Liverpool, Ohio.

Joining Patterson in 1948, Mr. Jacobson was appointed district manager of the Detroit office, a position he has held until his present appointment. Prior to this time, he was associated with Allis-Chalmers Manufacturing Company.

American's **30 SERIES HAMMERMILL**



for high volume reduction with minimum maintenance rely on hammermills backed by American's 50 years of experience.

Write for American's bulletin **BETTER STONE CRUSHING**

American **PULVERIZER COMPANY**

ORIGINATORS AND MANUFACTURERS OF RING CRUSHERS AND PULVERIZERS

1059 MACKLIND AVE. ST. LOUIS 10, MO.

Enter 247-A on card, page 255

HAYWARD CLAMSHELL BUCKETS

WORK LONGER, WORK FASTER, WEAR LESS!

Designed with rugged, one-piece alloy shells ... wide type, cast manganese steel cutting edges ... smooth shell interior for fast, capacity loads and easy discharge ... manganese bushings ... diagonal truss brace to keep shell in line ... has no side sway or back lash ... *plus many other cost-cutting design features!*

Get complete details. Write today for illustrated bulletin.

THE HAYWARD COMPANY

50 CHURCH STREET, DEP'T P, NEW YORK 7, N. Y.

Builders of Better Buckets Since 1888

Enter 247-B on card, page 255

TRACTOMOTIVE charts the

These charts are your guide for choosing a bucket and a loader that is just right for your job. You will operate at highest efficiency with the correct size bucket and the right size loader — get the highest possible production. No costly maintenance from overloading! And your loader will last longer, too. There's a whole family of buckets to choose from for each machine in the 5,300, 7,000 and 9,000-lb carry class.

How to use the charts

The bar opposite each bucket size shows the weight of materials per cu yd that you can handle with this size bucket. The area in color on the right side of the dotted line in the bar indicates the weight of materials that can be handled where loading is normal and operating conditions are good. The left side of the bar indicates the weight of materials that can be handled where conditions are adverse — such as steep grades, rough ground, or where you get excessive heaping.

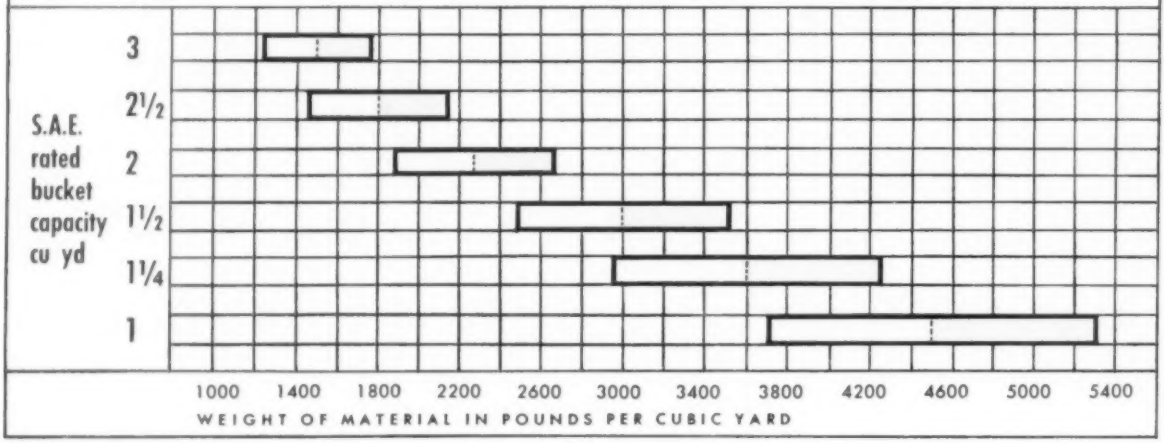
Example: Suppose you are loading sand weighing 2,600 lb per cu yd. If your operating conditions are good and you get normal loads, you would choose the 3-yd bucket for the TL-20, the 2½-yd for the TL-16, or the 2-yd for the TL-14.

If your operating conditions are adverse or you get excessive heaping, you would choose the 2½-yd bucket for the TL-20, the 2-yd for the TL-16, or the 1½-yd for the TL-14.

Your Allis-Chalmers dealer will be glad to go over these charts with you . . . discuss your job requirements and help you select the most efficient size bucket and loader for your work.

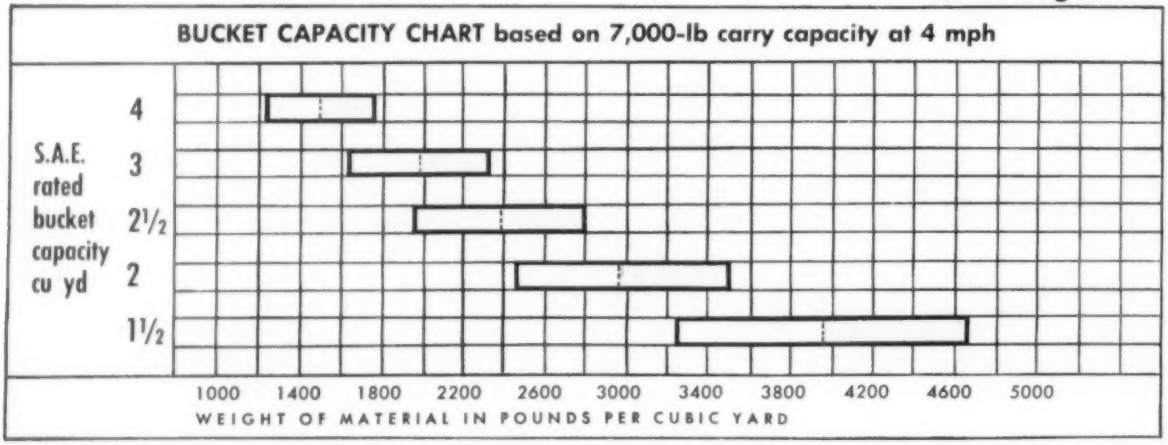
TL-14 TRACTOLOADER 81.5 hp diesel • 86 hp gasoline • Weight: 14,480 lb

BUCKET CAPACITY CHART based on 5,300-lb carry capacity at 4 mph

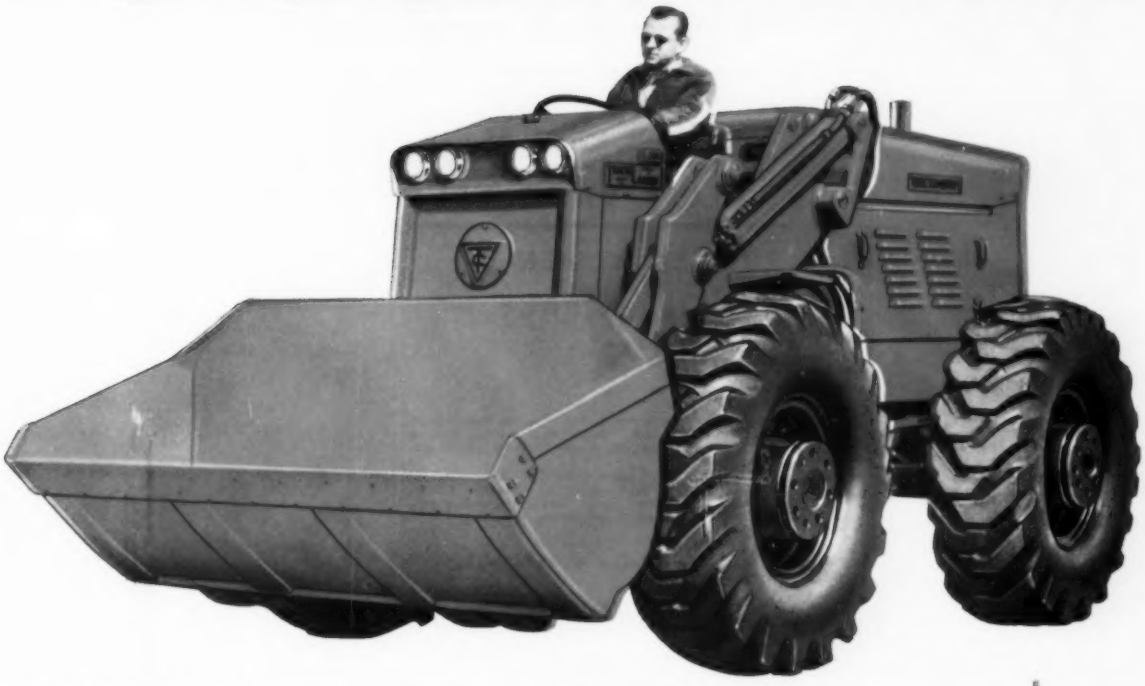


TL-16 TRACTOLOADER 104 hp diesel • 109 hp gasoline • Weight: 17,600 lb diesel 16,380 lb gasoline

BUCKET CAPACITY CHART based on 7,000-lb carry capacity at 4 mph

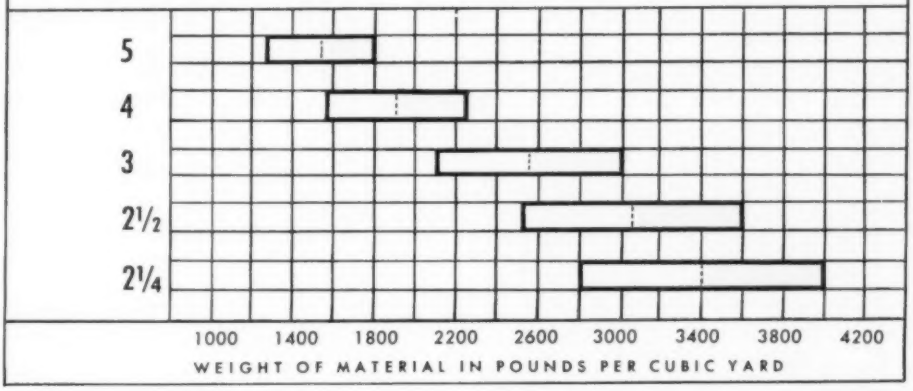


way to proper bucket selection



TL-20 TRACTOLOADER 130 hp diesel • Weight: 23,150 lb

BUCKET CAPACITY CHART based on 9,000-lb carry capacity at 4 mph



To find out what a **TRACTOLOADER®** can do for you . . . ask your Allis-Chalmers dealer to show you **"And a Great Deal More."**

SOLD AND SERVICED BY YOUR ALLIS-CHALMERS DEALER

TRACTOLOADERS
TRACTOSHOVELS
TRACTORIPPERS
TRACTOHOES
TRACTOSIDEBOOMS

TRACTOMOTIVE

TRACTOMOTIVE CORPORATION • DEERFIELD, ILLINOIS

TRACTO — *a sure sign of modern design*

"No. 1 ROCK BUSTER"

specially designed for QUARRY OPERATIONS

"Cape Ann"
FORGED
STEEL DROP BALL

- RUGGED DESIGN
- GREATER IMPACT
- ECONOMICAL

Used and approved by leading quarrymen everywhere, the "Cape Ann" Drop Ball is available in weights from 2000 to 12000 lbs.

It has a forged connecting link, protected by deep recess, for swivel or shackle. Strong alloy steel pin. Low cable replacements. Furnished complete as shown.

Write Today for full details

CAPE ANN ANCHOR & FORGE CO.
P.O. Box 360 • Gloucester, Mass.

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get the facts on
BROWNHOIST
job-engineered **BUCKETS**
for less money · direct from factory-to-you
write for your copy of this 24-page illustrated catalog today

Capacities from ½ cu. yd. to 400 cu. ft.

212

write to:

INDUSTRIAL BROWNHOIST CORPORATION
BAY CITY • MICHIGAN

Enter 250-B on card, page 255

Four promotions involving division and corporate executives of the White Motor Company, Cleveland, Ohio, have been announced.

JOHN C. TOOKER, general manager of White Motors Reo Division at Lansing, Mich., was named a vice-president of the White Motor Co., and general manager of the Reo Division. Mr. Tooker was president of Reo Motors, Inc. when that company was purchased by White in 1957.

NOAH O. GRESHAM, director of wholesale operations for White, was appointed vice-president of wholesale operations of the White Truck Division. He is responsible for White Truck Division's distributor and dealer organization, and has been with White since 1948.

C. M. BASILE, N. V. CHEHAK, and M. P. LUBER have been elected to new positions in Link-Belt Speeder Corporation's management group.

Mr. Basile joined the Cedar Rapids organization in 1950 as vice-president in charge of manufacturing. Since 1955 he has served as vice-president of manufacturing and sales until this most recent election to executive vice-president.

Newly elected to the position of vice-president and sales manager, Mr. Chehak came to Link-Belt Speeder in 1948, and has served since 1958 as sales manager.

Mr. Luber, formerly general plant superintendent, was elected vice-president of manufacturing.

Plan to acquire Tractomotive Corporation, Deerfield, Ill., through an exchange of stock is announced by Allis-Chalmers Manufacturing Company, Milwaukee, Wis. One of Tractomotive's principal product lines, the rubber-tired wheel loader, called the *Tractoloader* is sold through Allis-Chalmers construction machinery dealers throughout the world.

Tractomotive also manufactures front-end shovels, rippers, sidebooms for pipe-laying, and log loading equipment for attachment to crawler tractors. Since 1945, when the Tractomotive Corporation was founded, it has been a major supplier of this equipment to Allis-Chalmers.

"Our Universal Wobbler Feeder SMOOTHED OUT DISCHARGE FLOW OF WET LIMESTONE - REDUCED AUXILIARY EQUIPMENT MAINTENANCE"

Says Maule Industries, Inc., Miami, Florida

"Maintenance on auxiliary equipment has been reduced because the Wobbler Feeder smoothed out the discharge flow, minimized the tendency of wet material to 'surge' onto conveyors."

Maule Industries supplies concrete and concrete products to building and road contractors. They have a total of 21 plants and warehouses throughout eastern Florida.

"At our Prospect Quarry near Fort Lauderdale, we're working with Oolitic limestone which has a moisture content from 5 to 20%. Before installing a Wobbler Feeder, material was fed by a vibrating grizzly feeder. This was unsatisfactory because the grizzly permitted the relatively moist rock to 'surge' from feeder to roll crusher to conveyor belt." According to Maule Industries, Inc., this 'gushing' of material and water created an abnormal cleanup problem around the equipment and the production level was substantially affected.

"The Wobbler Feeder really proved it could handle this wet material. After its installation our production level was increased by as much as 65 tons per hour. The Wobbler supplies an even flow of rock to the roll crusher with a highly efficient separation of fines.

"In fact, the Wobbler was so effective we installed another one at our Red Road Quarry in combination with a Universal Impact Master."

How Universal's Wobbler Feeder Works — The Universal Wobbler Feeder feeds and scalps in one operation. Elliptical-shaped bars form the bed of a hopper and are set in alternate vertical and horizontal positions. Turning of the bars imparts a rocking, tumbling forward motion to the load. Fines drop through spacing between bars. Oversize is delivered off the end. Unlike a screen, the Wobbler does not vibrate — nor will it clog in wet sticky material.

What the Universal Wobbler Feeder has done toward lowering maintenance costs and increasing capacity for others it can do for you. Tell us the kind of material to be handled, the percentage of fines in the feed, size of fines to be removed and the desired capacity in tons per hour. We'll furnish complete information.

PETTIBONE UNIVERSAL
In Cedar Rapids Since 1906

UNIVERSAL ENGINEERING CORPORATION

619 C Avenue, N.W., Cedar Rapids, Iowa

Subsidiary of Pettibone Mulliken Corporation, 4700 W. Division Street, Chicago 51, Illinois

WEMCO, a Division of Western Machinery Company, San Francisco, Calif. has made the following changes in its general sales department. Under the new organization F. VICTOR SCHNEIDER becomes field sales manager and DOUGLAS E. NEWTON will be headquarters sales manager.

WILLIAM H. RECK will continue in his position of consulting metallurgical engineer specializing in flotation problems. DONALD W. JENKINSON has been appointed consulting metallurgical engineer handling gravity concentration problems. CHARLES E. GOLSON has been named manager of sales development in the aggregate industry.

HAROLD K. COGSWELL remains as eastern regional sales manager and GORDON E. COFIELD has been named to the newly created post of midwest district sales manager. DAVID L. SPRINGSTON has been named manager of coal sales. Completing the changes is the appointment of JOSEPH J. DAVEY as manager of torque-flow pump sales.

The Dayton Rubber Company will soon begin production of Poly-V power transmission belts as a result of an exclusive licensing arrangement with Raybestos-Manhattan, Inc., Passaic, New Jersey.

These new belts, coupled with Dayton's complete line of V-belts, will extend Dayton's coverage in the power transmission field to areas not previously covered. Dayton Rubber will market the new line through its present field sales organization. Raybestos-Manhattan will continue to make and distribute Poly-V belts through its own sales organization.

• Crane Carrier Corporation, Tulsa, Okla., has just completed its 500th vehicle equipped with planetary axles. A pioneer in assembly-line production of custom chassis for off-the-road equipment, Crane Carrier uses planetary axles made by the Automotive Division of Clark Equipment Company, Buchanan, and Jackson, Mich., throughout its line of 25-ton to 80-ton vehicles.

Appointment of HOLTON E. FOX to the post of district manager, Philadelphia District Sales Office, has been announced by SKF Industries, Inc., Philadelphia, Pa. Mr. Fox, formerly a field engineer in the ball and roller bearing manufacturer's Pittsburgh District, fills a vacancy created by the appointment of HAROLD W. SPEIDEL to the newly created position of manager, Sales Product Planning.

A. L. STEWART has been named engineer-in-charge of crushing, grinding and minerals processing machinery of Allis-Chalmers Manufacturing Company, Milwaukee, Wis.

Mr. Stewart joined the company in 1942, and has served since 1955, with headquarters in Cleveland, as regional representative for crushing, cement and mining industries.

CHESTER C. VOSS has been named chief engineer for the Ka-Mo Tool Department, Kwik-Mix Company, division of the Koehring Company, with headquarters in Cicero, Ill.

Prior to taking this new position, Mr. Voss had been associated with the International Harvester Co. at the Melrose Park plant near Chicago, where he was engaged in product design, advance engineering for the diesel group.

Reorganization of Gar Wood Industries' truck equipment executive sales staff has been announced. HAROLD H. HIPPLER, formerly general sales manager, truck equipment, becomes assistant director of truck and construction equipment sales. He has been associated with Gar Wood since 1924.

D. J. BYRD, formerly Load-Packer refuse collection sales manager succeeds Mr. Hippler as general sales manager, truck equipment, and has been with the firm since 1941. H. J. HOWERTH, who was sales manager for the winch line is now assistant general sales manager of truck equipment.

American Hoist and Derrick Company, St. Paul, Minn., has appointed H. M. PATTON to the newly created position of works manager. In his new post, he will have complete responsibility for the operation of the company's St. Paul plants. Mr. Patton joined American Hoist in 1942 as foundry superintendent.

FOR THE CONTROL OF ROCK, ORES, ETC.
TO CRUSHERS, CONVEYORS, ETC.

ROSS CHAIN FEEDERS

ROSS DROP-BAR GRIZZLY FEEDERS

ROSS SCREEN & FEEDER CO.
100 Quimby Street
WESTFIELD, N. J.

ROSS ENGINEERS LTD.
11 Walpole Road
SURBITON, SURREY, ENGLAND

CANADIAN LICENSEE: **DORR-OLIVER-LONG LTD.** ORILLIA, ONT.

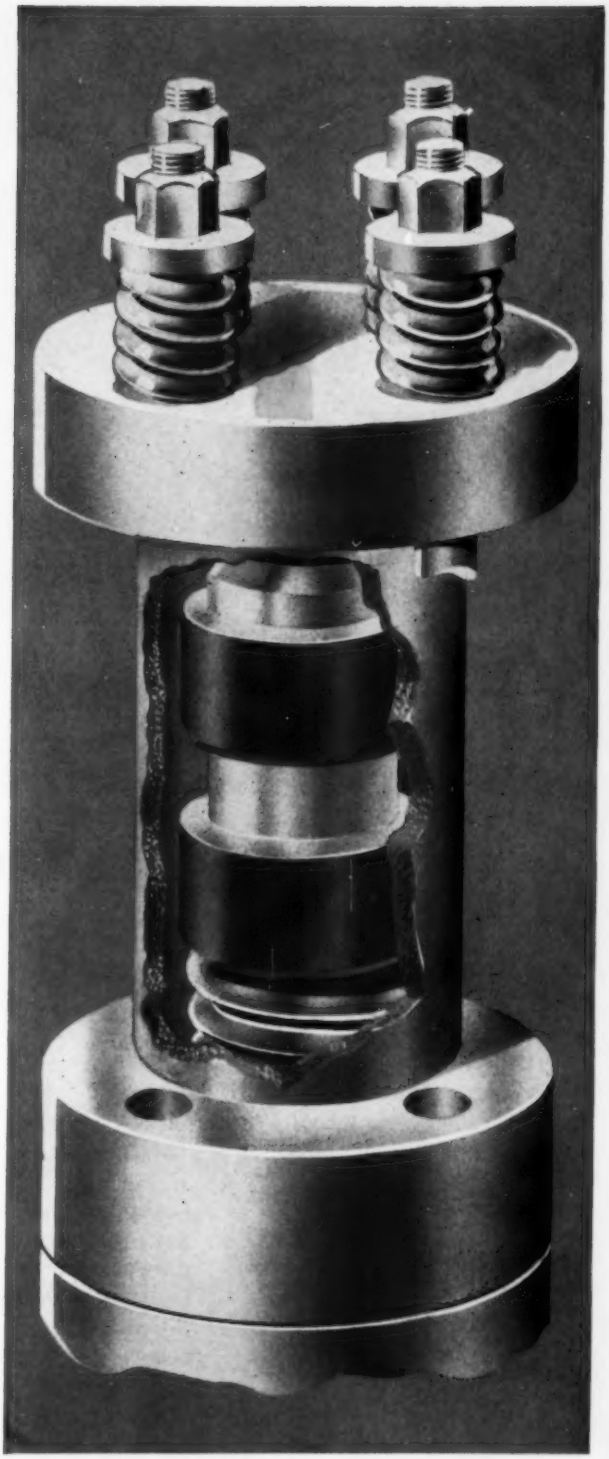
Enter 252 on card, page 255

NOW KOPPERS LEADS AGAIN

by bringing you lower precipitator maintenance and operating costs with

K-30*

bonded pistons on pneumatic vibrators



By eliminating the need for lubrication of the rapping mechanism in electrostatic precipitators, Koppers saves you many operational man-hours and maintenance costs.

This lubrication-free operation results from bonding a new wear-resistant material to vibrator piston surfaces. This special self-lubricating compound, identified by Koppers as "K-30," is composed of Teflon† and other wear-resistant materials that together provide a self-lubricated surface.

Most rapping mechanisms demand regular maintenance to be trouble-free, but "K-30" eliminates this need and provides more reliable operation.

Koppers research, backed by many years of experience in the electrostatic precipitation field will help you find the answer to your gas cleaning problems. Check with Koppers to learn how "K-30" can develop top efficiency in present or planned precipitator installations. For more information, write: KOPPERS COMPANY, INC., 6707 Scott Street, Baltimore 3, Maryland.

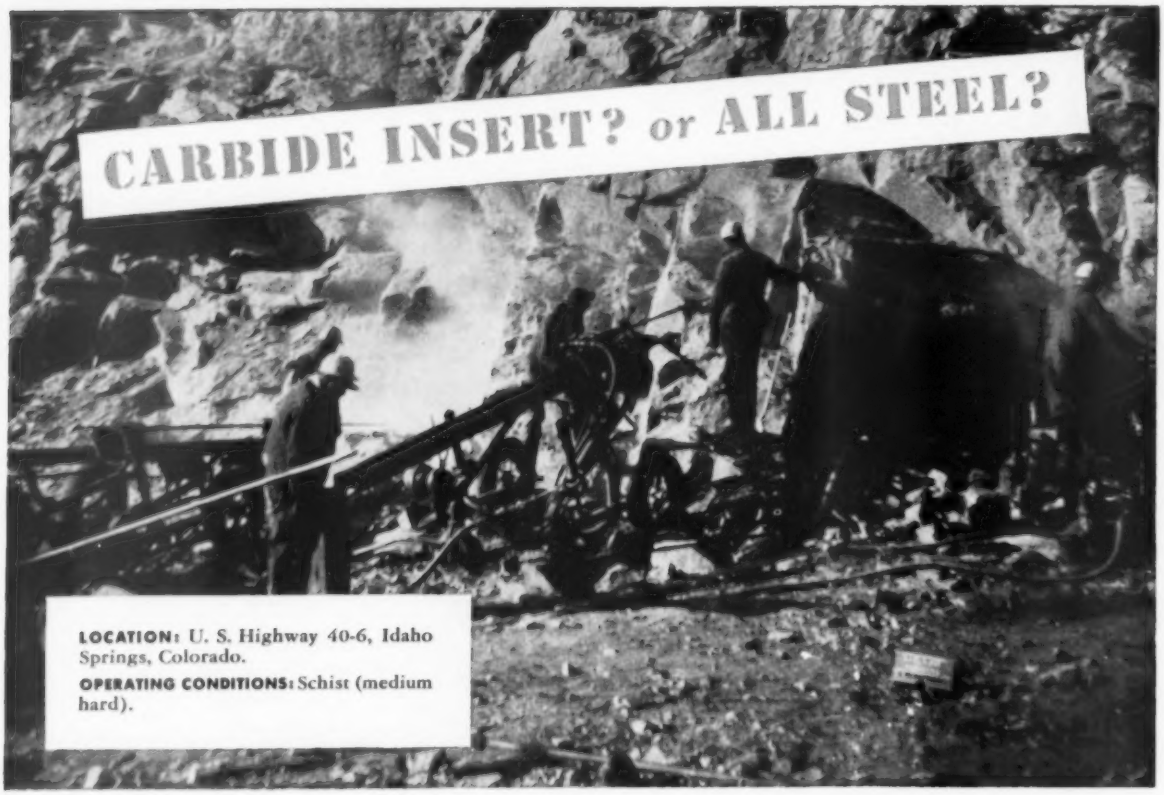
*Koppers Trademark

†E. I. duPont de Nemours & Company, Inc. trademark for tetrafluoroethylene resin

KOPPERS

ELECTROSTATIC PRECIPITATORS

Engineered Products Sold with *Service*



"We get lower cost and uniform results with TIMKEN® carbide insert bits"

. . . Reports Z. H. Lowdermilk, Inc.

THE first Colorado link in the Transcontinental Superhighway—four lanes on U. S. 40-6 near Idaho Springs, Colo., — required drilling through schist. Z. H. Lowdermilk, Inc., report they get lower bit cost per foot-of-hole and consistent footage drilled with Timken® carbide insert bits.

On jobs like this, you can get maximum economies and best results using Timken carbide insert bits. But carbide insert bits are not always best in every case. In ordinary ground, Timken all steel multi-use bits save you the most. With correct and controlled reconditioning, they give you lowest bit cost per foot-of-hole when you can drill full increments of steel.

Whichever type you use, your drillers will save time. Timken carbide insert and all steel multi-use bits are interchangeable in the same thread series. Drillers can change bits right on the job without changing drill steels.

Both bits are made of Timken electric furnace fine alloy steel. We're the only American removable bit manufacturer that takes the extra quality control step of making its own steel. For further protection, Timken bits have a specially developed shoulder union that guards threads against drilling impacts.

To get the right and most economical bit for your job, call or write The Timken Roller Bearing Company, Rock Bit Division, Canton 6, Ohio. Cable: "TIMROSCO".

Timken threaded all steel multi-use rock bit

Timken threaded carbide insert rock bit

TIMKEN

TRADE-MARK REG. U. S. PAT. OFF.

your best bet for the best bit for every job

More Information, Please

Use postcard to receive literature or details on new equipment and products reported in this issue.

HOW TO SPECIFY PERFORATED METAL SCREENS is explained in 12 steps in a new brochure available from *Cross Perforated Metals, National-Standard Company*. The brochure covers Cross Hexcreen, Conidure pierced sheets, and Rima wedge-shaped-wire screens. **(301)**

A DUROLITE BLOCK CATALOG which contains complete specifications, including tonnage capacities and recommended wire rope sizes for Durolite blocks and sheaves, is available from *Sauerman Bros., Inc.* Durolites are stocked in sizes from 6 to 8 in. with bronze bearings and from 8 to 42 in. with roller bearings. They are manufactured in capacities from 1-ton single blocks to 600-ton multiple sheave assemblies. **(302)**

THE ABILITY OF FORGED TRAKS to operate where rubber-tired equipment cannot travel is illustrated in a comprehensive booklet prepared by *Athey Products Corporation*. Diagrams reveal how Athey Traks provide absolute stability due to low center of gravity and eliminate side-slip with their long straight-edges Pictures show types of Trak-mounted equipment used in various industries. Specifications cover 11 Trak models. **(303)**

A NEW TYPE OF CONVEYOR BELTING which requires no troughing idlers has been developed by *Mono Belting Corporation* and is described and illustrated in Bulletin CB-1. Carrying capacity is said to be at least 50 percent greater than for the same width of conventional belting. **(304)**

NINE LINES OF ROLLER BEARINGS manufactured by *Rollway Bearing Company* are detailed in a catalog containing specifications and useful information on features and applications. The illustrated catalog also indicates the range of sizes in which the bearings are offered. **(305)**

A TRACTOR CATALOG from the *Euclid Division, General Motors Corporation*, deals with the Model TC-12 twin power crawler-tractor. This booklet is illustrated with photographs from various types of operations, cutaway and sectional views, and drawings that explain design features of the tractor. Included are condensed specifications and a performance chart. **(306)**

SCANDURA CONVEYOR BELTING for general heavy-duty service is discussed in a bulletin published by *Scandinavia Belting Company*. Features and specifications are presented, along with photographs showing installation of the belting handling various types of material. **(307)**

UNITAIR COMPRESSORS are featured in a new bulletin from the *Joy Manufacturing Company*. Included are specifications on eight sizes of the air-cooled compressors in the 15 to 125 hp., 81 to 641 c.f.m. range. Well-defined cross-section drawings and a complete rundown on all vital components make this a useful, informative booklet. **(308)**

SUBMERSIBLE ELECTRIC PUMPS are detailed in a folder available from *Stenberg Manufacturing Corporation*. The pump, the Flygt B-80L, has a capacity of 300 g.p.m. against a head of 25 ft. or 70 g.p.m. at 150 ft.; weighs only 175 lb.; and has the ability to handle highly abrasive material and to run dry without damage. **(309)**

ADJUSTABLE SPEED AND DRIVE CONTROL PROBLEMS are discussed in a new booklet produced by the Speed Variator Division of *The Cleveland Worm & Gear Company*. Designated Bulletin No. K-250, the booklet presents 8 pages of typical applications, along with methods and types of remote and auto-

July ***PIT AND QUARRY*** **1959**

Insert key numbers found below items on advertising, literature, and new equipment pages. Print company name if not keyed.

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431 South Dearborn Street
CHICAGO 5, ILL., U.S.A.

More Information, Please

Use postcard to receive literature or details on new equipment and products reported in this issue.

matic control, plus variable speed bedplate assemblies. **(310)**

A NEW SERIES OF ELECTROMAGNETIC PULLEYS for removing tramp iron from belt conveyed bulk materials is described in literature from *Stearns Magnetic Products*. Explained is the principle of operation and the application of magnetic pulleys in modern industries. Tables and formulas facilitate the selection of the right pulley size for normal separation, faster belt speeds, or inclined conveyors. **(311)**

TWO NEW HANDBOOKS published by *Chain Belt Company* contain practical information on how to install, operate, maintain, and extend the life of chain drives (Bulletin 59126) and chain conveyors and elevators (Bulletin 59127). They present the do's and don'ts the experts follow and are pointedly illustrated for complete understanding. **(312)**

ROCK BITS manufactured by *Oil Tool Manufacturing Company, Inc.*, are covered in an illustrated catalog which gives available sizes and specifications of all designs, recommended use of each, and general plant information. **(313)**

AIRCOMATIC WELDING of mild steel and low alloy steels with carbon dioxide shielding gas is discussed in a manual issued by *Air Reduction Sales Company*. The manual covers both the conventional CO_2 and the Dip Transfer CO_2 processes, with descriptions of outstanding characteristics; how both conventional and Dip Transfer welding are applied to specific jobs; and the equipment used in Aircomatic CO_2 welding. **(314)**

CHARACTERISTICS OF PARA-FLEX COUPLINGS are explained in a bulletin prepared by *Dodge Manufacturing Corporation*. Para-Flex couplings have a flexing body which automatically compensates for all combinations of misalignment and end float and absorbs torsional vibration. **(315)**

ACTION PHOTOS OF THE CRAWLER-MOUNTED 205 are included among the 50 illustrations in a new catalog published by *Koehring Company*. Photos show the 205 working as a ½-cu. yd. shovel and hoe, a crane handling a concrete bucket, a ¾-cu. yd. dragline, and a ¾-cu. yd. clamshell. Assembly photos and schematic line drawings illustrate construction features. **(316)**

A CATALOG OF SCREENS AND WASHERS for aggregate production, available from *Diamond Iron Works*, contains data on construction and tables of specifications and dimensions for the Diamond vibrating screen, scalping screen, combination scalping and scrubbing screen, and drag washer. **(317)**

DUMP TRAILERS manufactured by *Trailco Manufacturing and Sales Company* are detailed in a new folder which provides information on construction features, with a special section devoted to the Trailco Lock-O-Matic locking device, which reduces wear on body, chassis, and hoist. **(318)**

A MOLYKOTE LUBRICANT SELECTOR CHART which simplifies the choice of proper type of lubricant for practically any extreme pressure lubrication job, is offered by *The Alpha Molykote Corporation*. The chart evaluates every type of lubricant in the Molykote line based on temperature, environment, method of application, incorporation into common materials, and recommendations for various parts, operations, and conditions. **(319)**

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Pan American countries, $10 a year; elsewhere, $15 a year.

A THUNDERSTORM FIVE MILES AWAY...

Will it hold you up or blow you up?

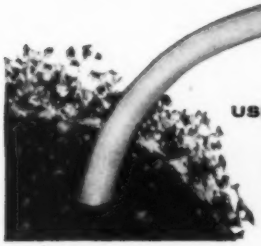
Under certain conditions, a thunderstorm five miles away can be the source of extraneous electricity that *could* result in a premature blast.
This hazard is so well recognized that blasting operations are often suspended whenever a thunderstorm is detected.

There is a simple, commonsense method of reducing this lost time while minimizing the hazard of premature shots. Use Primacord as the "down line" to detonate the charges in each hole – and as "trunk lines" to connect all holes.

Primacord is a *detonating* fuse. It cannot be set off by sparks or normal vibration – and even a direct hit by lightning failed to detonate it. Its use simplifies loading, and will enable you to plan your blasts to obtain better fragmentation.

When all is in readiness for the blast then, *and only then,*
attach fuse and cap or electric blasting cap to the end of your trunk line.
With Primacord, you call the shots!

THE ENSIGN-BICKFORD COMPANY, Simsbury, Connecticut
Since 1836



USE

GUARD AGAINST STRAY CURRENT HAZARDS

Primacord®

DETONATING FUSE

P-1

KOEHRING WORK CAPACITY *in action . . .*

De-watering a pit — At a western uranium mine, Koehring® 545 truck crane with clamshell digs a central drainage sump, from which water will be pumped out of the deep pit. Biggest truck crane in the Koehring line, this 545 is a heavy-duty workhorse on wheels! Lifts up to 45 tons. Boom lengths: 40 to 120 ft. — maximum 150-ft. boom-and-jib.

10-year veteran at limestone quarry — Originally, this Koehring 605 helped build the cement plant at this quarry. That was over 10 years ago. Since then, the 1½-yard has been used full time loading out limestone rock — about 225,000 tons per year. Rock is hauled from quarry to the plant by Koehring fast-shuttling 6-yard Dumptors.

High-lift stripper — With 2½-yard dipper on *50-foot* boom, high-lift 1205 shovel put stripping on a long-reach basis at this mine. At 45° boom angle, it cuts up to 51 feet-4 inches — dumps at height of 40 feet-10 inches. It's also available with *3-yard* dipper on 40-foot high-lift boom — or as a *standard* 3-yard with 30-foot shovel boom.

A new kind of loader — the full-revolving Koehring 205 SKOOPER digs, swings, dumps, then swings back to digging position *without traveling.* Twin hydraulic rams crowd 2-yard bucket along 7-foot level cut *(from "stand-still" position)* — or dig at any angle of bank slope. There are 3 interchangeable buckets. Excavator-crane convertibility.

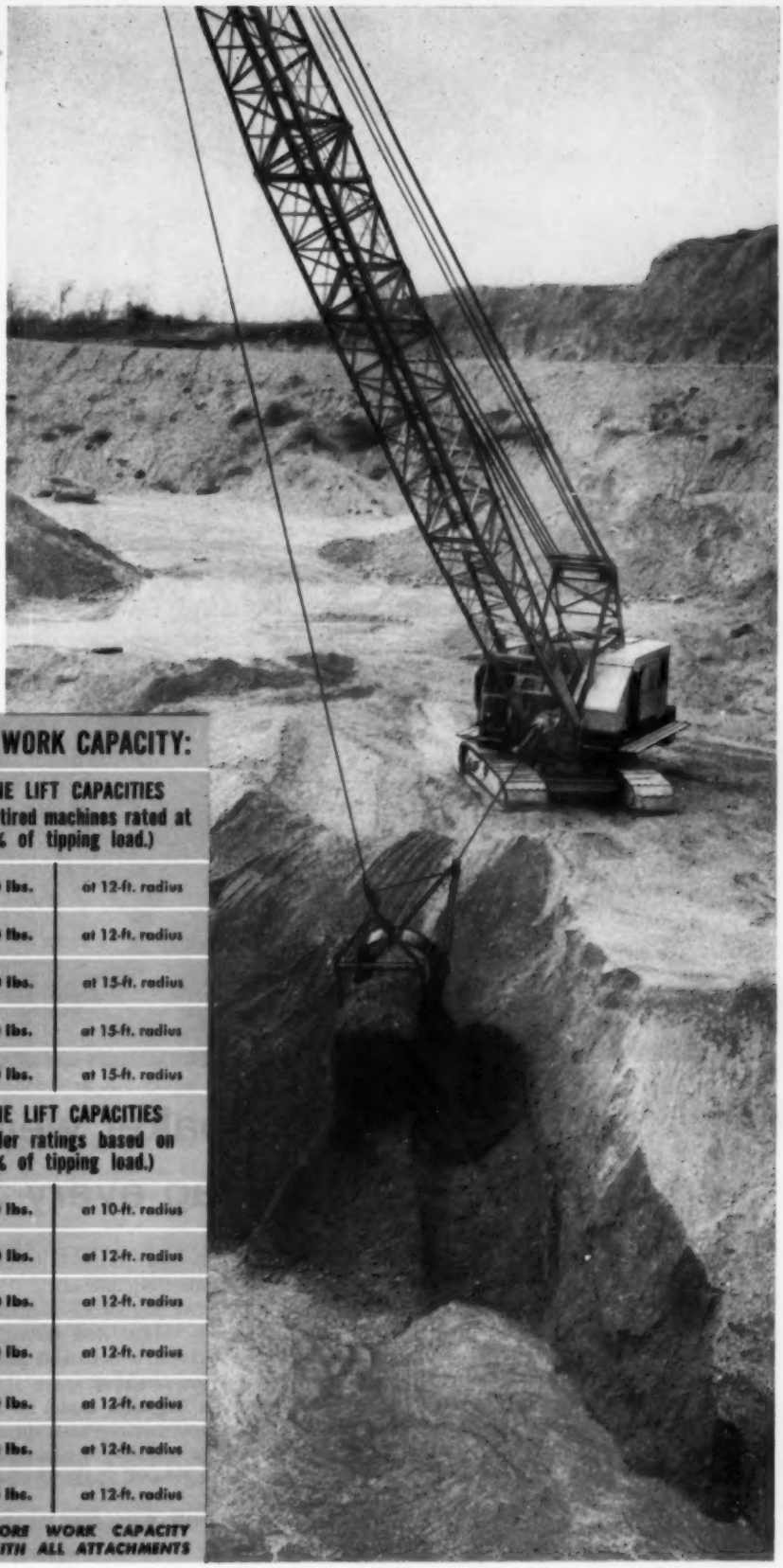
K934

KOEHRING DIVISION OF KOEHRING CO., Milwaukee 16, Wis.
Koehring excavators, cranes also manufactured in ENGLAND • SPAIN • JAPAN

In Canada:
KOEHRING-WATEROUS LTD.
Brantford, Ontario

Dredging gravel —

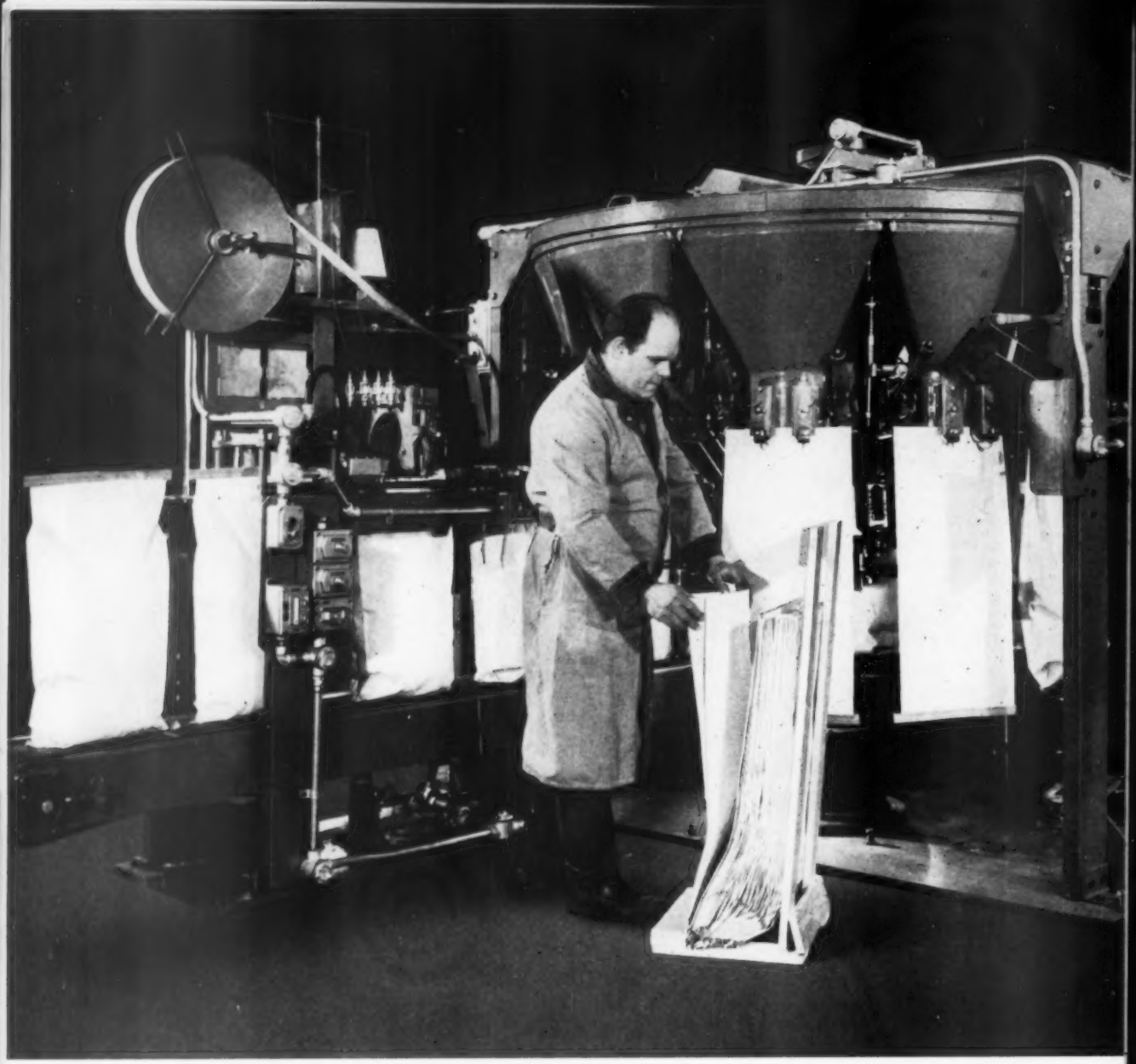
Working along the banks of a deep, water-filled pit, high-production dragline heaps a full bucket with every pass. It's the Koehring 805 — a special size that fills an important production gap on many mine and quarry operations. Depending on weight of materials, 805 handles 2 to 3-yard dragline bucket on 50 to 150-foot boom. Converts to clamshell, 52-ton lift crane, or 2-yard shovel. For all its size and capacity, the 805 is easy on the operator — 90% power-assist on main-drum clutches gives accurate "feel" of load, light lever-pull — helps increase output with all attachments. Want complete facts? Koehring distributor has all the details on this and other sizes (listed below). Call him today.



Quick facts on KOEHRING WORK CAPACITY:

MODEL	TYPE OF MOUNTING	CRANE LIFT CAPACITIES (Rubber-tired machines rated at 85% of tipping load.)	
ON RUBBER			
205	3-axle truck, or 21.5 mph Cruiser	30,000 lbs.	at 12-ft. radius
305	3-axle truck, or 18 mph Cruiser	50,000 lbs.	at 12-ft. radius
330	3-axle truck	60,000 lbs.	at 15-ft. radius
435	4-axle truck	70,000 lbs.	at 15-ft. radius
545	4-axle truck	90,000 lbs.	at 15-ft. radius
ON CRAWLERS	Size shovel	CRANE LIFT CAPACITIES (Crawler ratings based on 75% of tipping load.)	
205	½ Cu. Yd.	20,000 lbs.	at 10-ft. radius
305	¾ Cu. Yd.	30,000 lbs.	at 12-ft. radius
405	1 Cu. Yd.	40,000 lbs.	at 12-ft. radius
545	(Crane only — 85% rating)	90,000 lbs.	at 12-ft. radius
605	1½ Cu. Yds.	72,300 lbs.	at 12-ft. radius
805	2 Cu. Yds.	104,200 lbs.	at 12-ft. radius
1205	3 Cu. Yds.	190,000 lbs.	at 12-ft. radius

Extra lift capacity means . . . **MORE WORK CAPACITY WITH ALL ATTACHMENTS**



Famous Model "AF" Bagpaker® weighs, fills, settles and closes a 100-lb. bag every 2½ seconds!

With this engineering marvel at his command, the *one man* in our picture can package from 15 to 25 BPM. And he can *instantly* adjust the rate of speed through the machine's variable drive.

The operator simply hangs empty multiwalls on the hopper spouts as the 10-station turret rotates past him. The Model AF Bagpaker takes over from there.

It accurately *weighs* any free-flowing or semi-free-flowing material, quickly *fills* the bag, *settles* it by vibration, automatically *preforms* the top, and *stitches* it tight. You can choose from nine different closures. Bagpak's exclusive "Cushion Stitch," a reinforced two-thread double-lock chain stitch, is standard equipment.

The Model AF Bagpaker is ruggedly constructed of heavy welded steel throughout. Gears are fully enclosed and bathed in oil. Critical parts are of *stainless steel*.

There is a Bagpaker model for every need. They range from the completely automatic Model "A" Bagpaker, capable of packaging up to *60 tons per hour*, to small, manually operated economy models.

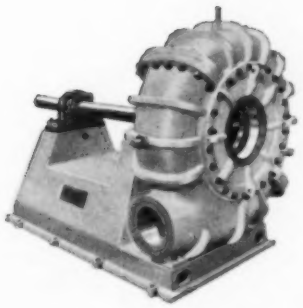
Whatever your multiwall packaging needs, it will pay you to talk to your Bagpak sales and service representative.

Bagpak Division **INTERNATIONAL PAPER** New York 17, N. Y.

" He thought it was just another pump!"

NOW— MODERN
THOMAS Durable

Dredge Pumps Dominate "home of sand & gravel" in Alabama



Flomaton is one of the largest sand and gravel producing sections in Alabama, and 8 years ago one of the Flomaton operators installed a THOMAS Durable Dredge Pump—the modern solids pump, modern in design and made of modern abrasion-resistant material. It was then the only THOMAS pump in the Flomaton field where a dozen or more sand and gravel pumps of various makes were in use.

Today in 1959, THOMAS pumps dominate the Flomaton pits with a total of 75 to 80% of ALL makes of pumps in use there. Mr. Campbell explains in his letter herewith that in production two THOMAS pumps equal 3 pumps of other makes. He adds that a THOMAS pump uses less power, has lower maintenance cost, longer life, needs less repairs. Photo above shows Mr. Campbell and two of his three sons who are in business with him.

CAMPBELL SAND & GRAVEL COMPANY
TELEPHONE 3674
FLOMATON, ALABAMA

April 23, 1959

Thomas Foundry Company
Birmingham,
Alabama.

When one of my neighbors got hold of a Thomas Pump about 1951 I thought it was just another pump. Then when he got two more in the next year or two, I knew he must have something.

I decided to try one in 1954 and got another in 1956. With these two Thomas Pumps I got production equal to the three [redacted] Pumps that I had been using. I was even more surprised when each Thomas Pump used no more power than each of my old pumps but produced much more sand and gravel.

The Thomas Pumps are easier to work on and easier to line up and it can be done in less time and repair parts are cheaper because they last so much longer. You also give me mighty good service.

Now I have three Thomas Pumps and its easy to understand why Thomas Pumps have replaced almost all the other makes in this section. You can't beat the Thomas Pump.

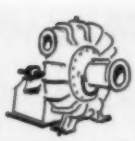
Very truly yours,

Campbell Sand & Gravel Co.

Rufus Campbell

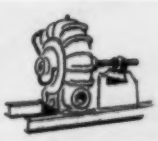
Rufus Campbell, Owner

THOMAS Pumps and THOMAS Service go hand in hand—an unbeatable combination which proves over and over again the slogan: "You cannot buy at any price a more durable pump than a THOMAS for sand and gravel—you cannot buy one that will make you as much money." (Range of sizes is from 6-inch to 16-inch.)



THOMAS FOUNDRIES Inc.

P. O. BOX 1111, BIRMINGHAM, ALABAMA



PRESTRESSED!

Quaker Thermoid Conveyor Belting keeps rolling with the punches

Before it ever comes to you, the heaviest tension you'll put on Thermoid-Quaker Conveyor Belting has already been built in—and then released *after* curing. So the rubber and fabric are really in *compression* when you put the belting to work—ready for the toughest pull without over-straining the yarn or the cover.

There's a Thermoid-Quaker belting designed with just the combination of properties you need for each conveying job. To get the right belting for *your* needs, talk with the Thermoid industrial distributor nearest you, or write to *Thermoid Division, H. K. Porter Company, Inc., Tacony & Comly Sts., Philadelphia 24, Pa.*

Notice how the special ply construction of Thermoid-Quaker "VICTOR" Belting provides greater flexibility at the edges—more shock-absorbing rubber where the worst beating occurs.

THERMOID DIVISION **PORTER** **H.K. PORTER COMPANY, INC.**

PORTER SERVES INDUSTRY: with Rubber and Friction Products—THERMOID DIVISION; Electrical Equipment—DELTA-STAR ELECTRIC DIVISION, NATIONAL ELECTRIC DIVISION; Copper and Alloys—RIVERSIDE-ALLOY METAL DIVISION; Refractories—REFRACTORIES DIVISION; Electric Furnace Steel—CONNORS STEEL DIVISION, VULCAN-KIDD STEEL DIVISION; Fabricated Products—DISSTON DIVISION, FORGE AND FITTINGS DIVISION, LESCHEN WIRE ROPE DIVISION, MOULDINGS DIVISION; and in Canada, Refractories, "Disston" Tools, "Federal" Wires and Cables, "Nepcoduct" Systems—H. K. PORTER COMPANY (CANADA) LTD.

NOW..clam-action 4-in-1 PLUS values in NEW TD-6 and TD-9 crawlers!

NEW 6-cylinder diesel smoothness and power wallop! Both the new TD-6 and TD-9 Four-in-One's are powered with the millions-of-hours-proven, direct-starting, 6-cylinder International UD-282 diesel. Naturally-aspirated in the TD-6, it produces 55 net engine hp; turbocharged in the TD-9, it delivers 71 net engine hp!

New job-getting efficiency! Both the new TD-6 and TD-9 Four-in-One's have increased track length, for new tough-job stability and flotation. Both are geared with new speeds for greater tough-job capacity. Both have the power-transfer efficiency of new full-face, sintered metal engine clutches.

And both the new TD-6 and TD-9 have exclusive vented track-roller and idler shafts, assuring positive seal protection from over-lubrication. Big 300%-increased lube capacity shells provide 500-hr. track-roller greasing intervals!

Move the selector lever! Prove versatility unlimited of exclusive 4-in-1 as Skid-Shovel; space-saving, bottom-dumping clamshell; full-sized bulldozer; inch-close-accurate "carry-type scraper." Add up how many tens of thousands of dollars a new TD-6 or TD-9 four-in-one can save you, doubling for one limited-duty rig after another! Measure the plus value of exclusive shock-swallowing Hydro-Spring. See your International Drott Distributor for a demonstration!

International Harvester Company, Chicago 1, Illinois
Drott Manufacturing Corp., Milwaukee 15, Wisconsin

INTERNATIONAL®
DROTT®

New 1⅛ cu. yd. International Drott TD-6 Four-in-One. New TD-9 Four-in-One has 1½ cu. yd. bucket capacity.

Designed to new engineering standards

CROSBY-LAUGHLIN Load-Rated* HOOKS

give you highest capacity per size

- 100% drop forged . . . heat treated
- Guaranteed not to break
- Most complete line, carbon or alloy steel
- Working capacity and identification forged on every hook

Easily converted to safety hook at any time

WRITE FOR FREE SPECIFICATIONS CATALOG

Stocked by leading distributors everywhere

Buy Genuine Crosby-Laughlin . . . the hooks that are painted red.
*trademark

CROSBY-LAUGHLIN *Division*
AMERICAN HOIST AND DERRICK COMPANY
FORT WAYNE, INDIANA

Manufacturers of Crosby Clips and "Load-Rated" Blocks . . . Crosby-Laughlin "Load-Rated" Fittings . . . Lebus Load Binders and Snatchblocks.

Enter 264-A on card, page 255

DEPENDABLE FOR 60 YEARS

Woven Wire

ALLOY SCREENS

TWIN CITY IRON & WIRE CO.
St. Paul, Minnesota

Enter 264-B on card, page 255

CONTRACT CORE DRILLING

EXPLORATION FOR MINERAL DEPOSITS
INCLUDING URANIUM & LIMESTONE — ANYWHERE

FOUNDATION TEST BORING

GROUT HOLE DRILLING

Skilled crews and complete stock of core drills and accessory equipment maintained at all times

Core Drill Contractors for more than 60 years

JOY MANUFACTURING CO.
Contract Core Drill Division
MICHIGAN CITY, INDIANA

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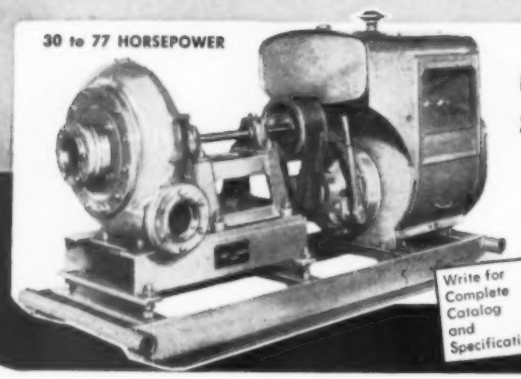
30 to 77 HORSEPOWER



NEW *Lightning* PORTABLE
SAND & GRAVEL PUMPS
4 AND 6 INCH SIZES

New design for a wide variety of uses and pumping conditions. 4-inch pump has 30 H.P. air-cooled engine; 6-inch pump has 6-cylinder radiator cooled engine. All wearing parts are of Hi-Chro-Hi, a super hard, abrasion resisting semi-steel. Maintenance is negligible, parts replacement is simple.

KANSAS CITY HAY PRESS CO.
Manufacturers of Heavy-Duty Lightning Sand and Gravel Pumps
801 WOODSWETHER ROAD • KANSAS CITY, MISSOURI

Enter 264-D on card, page 255

"when I grow up I'm going to run one of those"

When a fellow daydreams out loud to his best girl, he dreams *big*. Running a big Bucyrus-Erie electric shovel means he's really arrived!

Many a mine or quarry owner who's now "arrived" got his start years ago with Bucyrus-Erie electrics.

That's why two out of every three shovels on the great iron ranges of northern Minnesota and upper Michigan are Bucyrus-Eries. It's also why B-E machines have long been *the standard* in large quarries, in open pit mines, and on the biggest dam and construction projects all over the world. *Wherever important jobs require the best equipment* — that's where you'll see Bucyrus-Erie.

BUCYRUS ERIE®

Two TR-260's take over... cut hauling costs in half

Olen Humphres
Ashmore, Illinois

Olen Humphres, owner-operator of several quarries in central Illinois, replaced a fleet of six trucks with two Allis-Chalmers TR-260 rock wagons. His choice of equipment paid off. Actual on-the-job analysis showed a substantial increase in hauling production . . . an amazing 50-percent reduction in hauling costs.

The TR-260 wagon's big opening speeds loading cycle at quarry site.

Sharp turns, soft footing and 10-percent grades are taken in stride by TR-260 rock wagons.

A few years ago, Humphres used six trucks for all hauling work at his 520-acre limestone quarry in Ashmore. However, he was not satisfied with the results he was getting. His trucks had trouble working in muddy terrain, their maneuverability was limited in tight quarters, and hauling costs were out of line. These problems were solved when two TR-260 rock wagons replaced the six trucks and cut hauling costs in half.

TR-260's work where trucks can't go

Today, three TR-260's working a typical 6-month schedule, move approximately 300,000 tons of limestone from quarry to crusher over a 3,250-ft. course. About 50,000 tons of this material is stockpiled.

Hauling 18-ton loads, the "260's" move up 10-percent grades, often through soft, muddy underfooting. Big low-pressure rock tread tires provide excellent traction and flotation . . . keep the TR-260's riding high where trucks sank axle deep. Positive hydraulic steering lets the operators "duck walk" out of extremely soft spots when a straight-ahead pull won't do the job.

Fast-acting hydraulic system provides 90-degree steering to the left or right for quick, smooth spotting under power shovels and at the hoppers.

move ahead with ALLIS-CHALMERS...

Operator dumps load over steep edges confidently, safely—big air brakes are applied to all four wheels simultaneously. After dumping, approximately ⅔ of the TR-260's weight is on its drive wheels for safe, fast acceleration.

The TR-260's 21-in. tractor underclearance greatly reduces the danger of hanging up on high spots . . . eliminates the problem of getting stuck in soft material. The T-260 tractor bottoms are covered by heavy-duty steel plates. There are no exposed differentials, shafts, or axles to break.

"You can't wear 'em out"

Olen Humphres' choice of Allis-Chalmers rock wagons goes back to his success with Allis-Chalmers power units.

"You can't wear 'em out," Humphres explains. "One of my Allis-Chalmers engines has been working for me since I started quarrying some 21 years ago."

Today, in addition to the TR-260's, Humphres uses a 150-hp HD-16 crawler tractor and 20-yd pull-type scraper for stripping overburden. From 5 to 30 ft of overburden must be removed to work the limestone. The HD-16 and two other Allis-Chalmers tractor-dozers handle earth-moving, push-loading and stockpiling assignments. There are four Allis-Chalmers power units on the job. The largest unit, 390-hp, supplies power for the crusher.

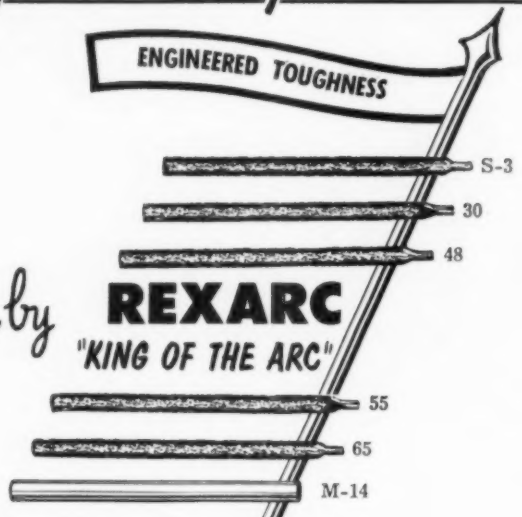
Your Allis-Chalmers dealer will show you, by actual demonstration, how the TR-260 can speed your hauling. He also will tell you how the R-260 rock wagon can be interchanged with the S-260 scraper for added work and profits. Allis-Chalmers, Construction Machinery Division, Milwaukee 1, Wisconsin.

... power for a growing world

BETTER WELDS ★ SMOOTHER, EASIER APPLICATIONS ★ ADDITIONAL SAVINGS ★ BETTER WEAR RESISTANCE

A royal proclamation by

ENGINEERED TOUGHNESS



REXARC
"KING OF THE ARC"

presenting:

SIX ELECTRODES
TO COVER 95% OR MORE OF
YOUR BUILDUP AND HARD-FACING REQUIREMENTS

EACH IN FOUR SIZES

Contact your nearest distributor, or the factory direct, for free 20-page manual

METALLIC COATING BECOMES A PART OF THE DEPOSIT!

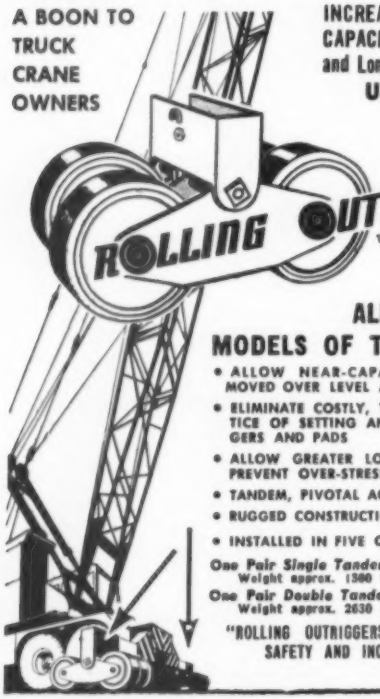
MANUFACTURED BY
The SIGHT FEED GENERATOR COMPANY

WEST ALEXANDRIA, OHIO, U.S.A.

Enter 268-A on card, page 255

A BOON TO TRUCK CRANE OWNERS

INCREASE YOUR MOVING CAPACITY in both Short and Long Stick operations UP TO 50% with



ROLLING OUTRIGGERS
TRADE MARK PATENT PENDING

that FIT
ALL MAKES AND
MODELS OF TRUCK CRANES

- ALLOW NEAR-CAPACITY LOADS TO BE MOVED OVER LEVEL AND RUGGED TERRAIN
- ELIMINATE COSTLY, TIME-CONSUMING PRACTICE OF SETTING AND RE-SETTING OUTRIGGERS AND PADS
- ALLOW GREATER LOAD DISTRIBUTION AND PREVENT OVER-STRESSING CRANE CARRIER
- TANDEM, PIVOTAL ACTION WHEEL ASSEMBLY
- RUGGED CONSTRUCTION
- INSTALLED IN FIVE QUICK MINUTES

One Pair Single Tandem Units, Weight approx. 1500 lbs.
One Pair Double Tandem Units, Weight approx. 2630 lbs.

"ROLLING OUTRIGGERS" INSURE MOBILITY, SAFETY AND INCREASED PROFITS

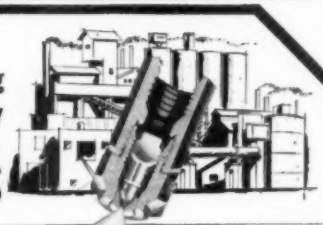
Manufactured by Lincoln Welding Works, Inc., 1329 So. "A" St., Las Vegas, Nevada

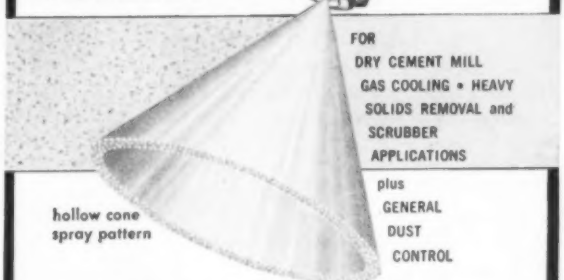
WRITE FOR NAME OF "ROLLING OUTRIGGERS" DEALER IN YOUR AREA

SOME EXCELLENT DEALERSHIPS ARE STILL AVAILABLE

Enter 268-B on card, page 255

atomizing
SPRAY NOZZLES





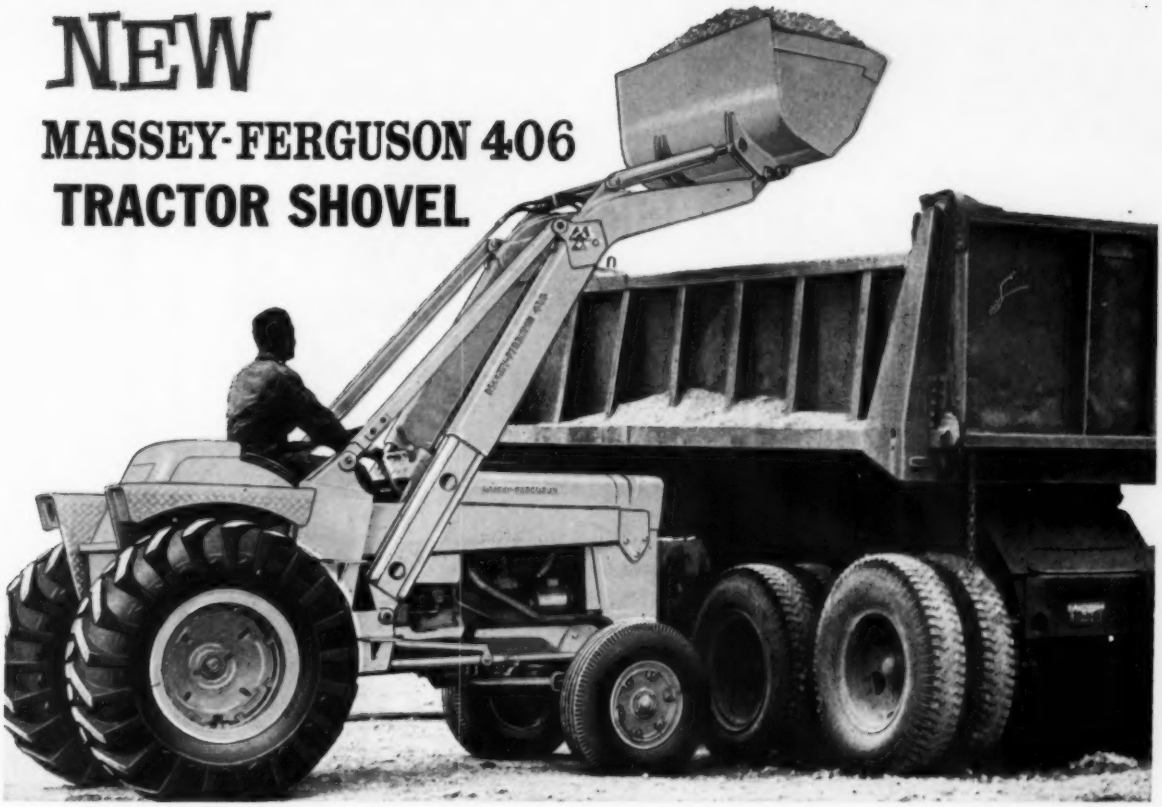
HIGH EFFICIENCY spray nozzles that operate on hydraulic pressure alone and low water volume per hour. Provide even pattern distribution and excellent atomization. Made in stainless steel and brass for maximum service. Proved for performance in mill operation. Nozzles of all other types also supplied including pneumatic atomizing nozzles for every need.

SPRAYING SYSTEMS CO.
3224 Randolph Street • Bellwood, Illinois

FOR COMPLETE INFORMATION
write for Catalog No. 24

Enter 268-C on card, page 255

NEW
MASSEY-FERGUSON 406 TRACTOR SHOVEL



more loads... better loads... greater profits... because

Here's the BIG CHANGE in tractor shovels — the all-new, streamlined Massey-Ferguson 406 1 cu. yd. tractor shovel. Now you increase your capacity with less investment. This rig does more BIG work in a day than machines that cost 50% more...yet it handles your utility jobs economically and efficiently.

JUDGE FOR YOURSELF

ask for a Trial Demonstration without Obligation

Compare and weigh the facts. Ask your Massey-Ferguson Industrial Dealer for a demonstration. You'll see it's worth buying.

X ***instant reversing***
Means faster cycling — no shifting no clutching...no levers to pull

X ***up-front visibility***
See at all angles — front, rear, both sides

X ***low thrust point —***
for direct push into the load, but high reach — 126" at hinge point

X ***compare***
Price...quality...performance

There's loading power at your finger tips...speed and directional control at the touch of your toe...and maximum visibility wherever you go. Instant reversing, low thrust point, high reach are just a few of its features. Integrated attachments — including the famous Davis Backhoe — give it unparalled versatility.

MASSEY-FERGUSON INDUSTRIAL DIVISION
Block 1000 South West Street • Wichita 13N, Kansas

Any way you look at it...

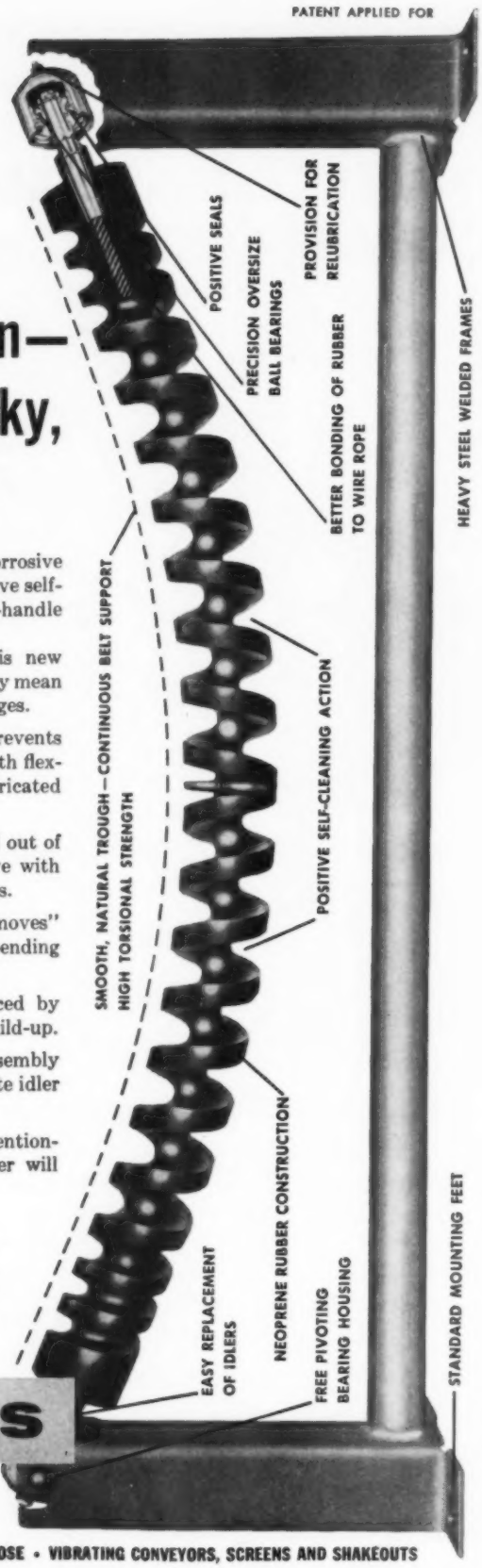
New Rubber Spiral Idler Defies Corrosion, Abrasion—Prevents Build-up of Sticky, Hard-to-Handle Materials

Here's the conveyor idler built to last longest in punishing corrosive atmosphere or extreme abrasive service! What's more, its exclusive self-cleaning rubber spiral prevents build-up of sticky, hard-to-handle materials!

The numerous design and construction advantages of this new Hewitt-Robins idler are shown in the illustration. Here's what they mean to you in terms of cost-cutting, time-saving, operating advantages.

- **LONG LIFE.** Neoprene spiral, completely covering wire rope, prevents attack in corrosive atmosphere. Uninterrupted spiral gives smooth flexing, maximum strength. Precision sealed bearings can be relubricated for still longer life.
- **SELF CLEANING.** As the spiral turns, it "works" any material out of the grooves as they change shape. This action is most effective with sticky materials which tend to build up on common types of idlers.
- **CONTINUOUS BELT SUPPORT.** The new rubber spiral design "moves" along the entire width of the belt; therefore, pinching and sharp bending of the belt are eliminated.
- **SELF TRAINING.** Belt training problems are greatly reduced by readily conforming rubber spiral, and by elimination of material build-up.
- **EASY REPLACEMENT.** The spiral, wire rope, and bearing assembly simply lifts out of its brackets—no tools are needed. The complete idler fits standard conveyor stringers.
- **TRUE OPERATING ECONOMY.** Under conditions where conventional idlers fail prematurely, the Hewitt-Robins rubber spiral idler will pay for itself many times over.

Deliveries of this revolutionary new idler are now being made in 18, 24, 30, and 36 inch belt sizes. In addition to the type shown, it is also furnished with a spreader frame for use in wire rope conveyor systems. For further information check your H-R distributor, or write Hewitt-Robins, Stamford, Connecticut. Ask for Bulletin 7-24.

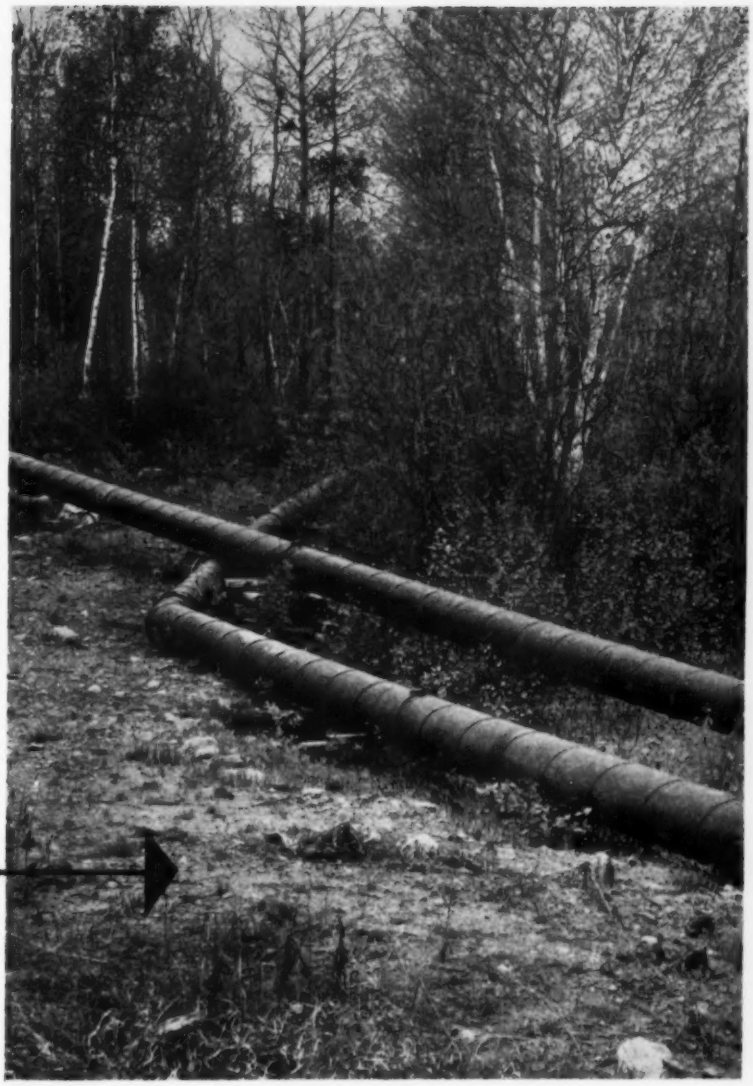


HR HEWITT-ROBINS

THE NAME THAT MEANS EVERYTHING
IN BULK MATERIALS HANDLING SYSTEMS . . .

CONVEYOR BELTING AND IDLERS • POWER TRANSMISSION DRIVES • INDUSTRIAL HOSE • VIBRATING CONVEYORS, SCREENS AND SHAKEOUTS

Low-Cost Handling of Water and Tailings



You can't beat lines of NAYLOR Spiralweld pipe for handling water and tailings.

NAYLOR pipe "goes" wherever you want it because it is light in weight, easy to handle, and can be made up quickly with the one-piece NAYLOR Wedgelock coupling to speed connection.

Whatever your mining operation needs may be—water, air, tailings or ventilating lines, it will pay you to consider the extra performance built into NAYLOR pipe.

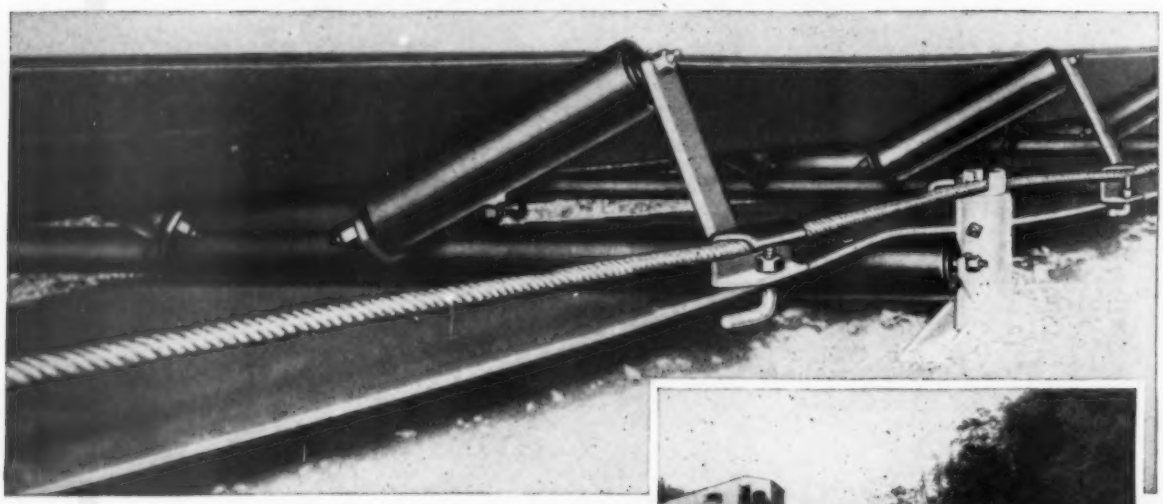
Write for Bulletin No. 59 for details

NAYLOR PIPE *Company*

1257 East 92nd Street, Chicago 19, Illinois

Eastern U. S. and Foreign Sales Office: 60 East 42nd Street, New York 17, N. Y.

The LONG Lo-Rope BELT CONVEYOR



Patents Pending

Offers ***Lower first cost—less maintenance • Easier installation • Self-training • Higher capacity—less spillage!***

In this unique design, the wire rope is located below the carrying belt and carrying idlers and the motion of the belt rocks the idlers in the direction of belt travel to provide automatic self-training. This feature, combined with the belt's deep 27° troughing angle, keeps the load centered at all times, materially reduces spillage, makes possible wider spacing between idlers, and provides high carrying capacity. Adjustable height "Platform Rocker" rope support stands minimize blocking and level belt automatically.

There are other reasons why it will pay you to use the LONG Lo-Rope Conveyor. This unit requires an absolute minimum of maintenance and is designed to give long, dependable service under all conditions. We'll be glad to send complete details without obligation.

For full information on LONG Lo-Rope Belt Conveyors or a demonstration, write us today

The LONG Company
Oak Hill, W. Va.

Enter 273 on card, page 255 →

Digging iron ore on the Mesabi Range near Aurora, Minnesota.

MARION 151-M—Power For Unmatched Digging in Mines and Quarries

A Marion 151-M in action is a familiar sight in many parts of the iron range, in copper mines, coal pits and quarries throughout the world. This 7-yard machine is ruggedly built throughout with ample power for continuous, high-speed production. It is readily convertible to dragline service with boom lengths from 80′ to 120′ and buckets from 4 to 8 yards.

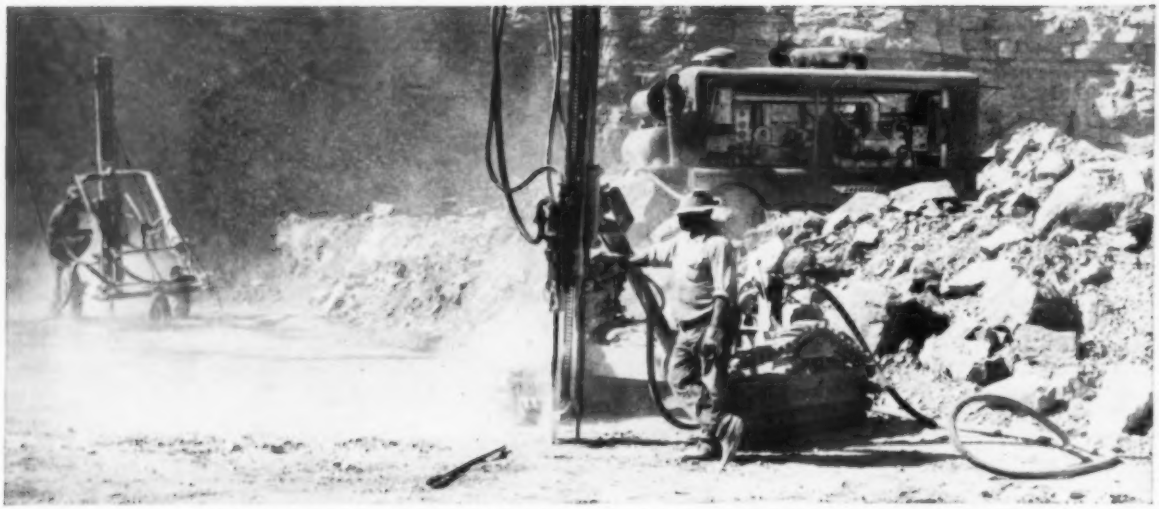
A 40-ton Marion 43-M truck crane loads 69,000 pounds at 13 feet. Such standard features as a torque converter, Marionair Control, power raising and lowering of the gantry and ballast give the operator big advantages. The strong, highly mobile carrier provides maximum maneuverability during travel and on the job.

nsult Marion Mining Specialists for lower costs on your property.

MARION

MARION POWER SHOVEL COMPANY—MARION, OHIO, U. S. A.

A Division of Universal Marion Corporation



11" PER MINUTE PER DRILL, IN LIMESTONE LEDGE: Constant full pressure produces maximum footage with this Thor self-propelled "Rocket" rig and BW-2 wagon drill. "Our Jaeger '600' rpm's less, and its 100 psi easily operates the two drills without lag," says owner.

UP TO 140 LICKS A MINUTE with Jaeger "600" behind a McKiernan-Terry 9B-3 four-ton double acting hammer. The operation is setting piles and steel for cofferdams on reinforced concrete bridge project.

ON PIPE TUNNELING WORK, auger deflection caused by fluctuating air pressure formerly necessitated 2 to 3 drillings per hole. With the constant pressure of a Jaeger rotary, one drilling is now enough.

"Our air costs less than ever with a Jaeger"

Owners of Jaeger rotary compressors uniformly note their lower cost of operation compared with other makes. In 8 hours' steady operation a Jaeger "600", for example, averages 48,000 fewer revolutions than any of five other compressors which use the same GM 6-71 diesel engine (1700 rpm full load speed compared with 1800 rpm). Output exceeds 500 cu. ft. of air per pound of diesel fuel.

SLOWER SPEED MEANS SAVINGS

Jaeger 85, 125, 250 and 365 cfm models are similarly efficient. The fuel savings are substantial. Because all operation is below the continuous horsepower curve, engine maintenance is at a minimum. In the compressor unit, 8000 hours without replacing a single vane is not at all unusual.

Enjoy this low cost, trouble-free operation on your own work. We will be glad to provide full details and demonstration, or send latest Catalog.

THE JAEGER MACHINE COMPANY

602 Dublin Avenue, Columbus 16, Ohio

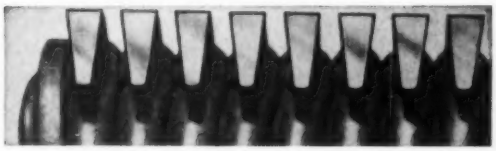
PUMPS • SPREADERS • FINISHERS • CONCRETE MIXERS • TRUCK MIXERS

HOW TO SELECT DEWATERING SCREENS THAT FIT YOUR REQUIREMENTS EXACTLY

How to select Perforated Plate

Let Hendrick suggest the analysis of H Quality Steel that will stand up longest under your operating conditions. Eliminate blinding with a Hendrick screen that provides full clearance. Get continued product uniformity from the accurate, uniform mesh of a Hendrick screen.

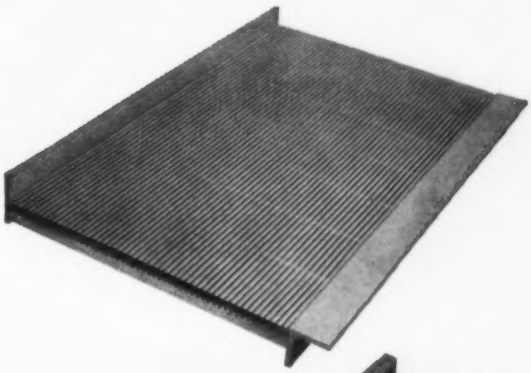
How to select Wedge Wire



Here are three things to look for: 1) Free clearance—to reduce chances of clogging and blinding. 2) A tapered profile bar, for dewatering efficiency. 3) A deep profile bar, to assure long service life and maximum load-carrying capacity. Get all of these in Hendrick Wedge Wire. There is a type to suit your operating conditions and your needs—whether you want good screening efficiency, good dewatering efficiency, or high resistance to abrasion.

How to select Wedge Slot Screens

For more efficient processing, look for accurately spaced, uninterrupted slots. For heavy-duty service, look for thick, parallel head flanges that maintain uniformity of openings. To prevent abrasion by large chunks, specify Skid Bars. Hendrick offers all of these—*plus* 8 different profile bars. Hendrick will gladly help you select the type that will stand up best under your operating conditions.



Hendrick

MANUFACTURING COMPANY

Headquarters for All Your Screening Needs

39 DUNDAFF STREET, CARBONDALE, PA.

Perforated Metal • Perforated Metal Screens • Wedge-Slot Screens • Hendrick Wedge Wire Screens • Architectural Grilles • Mitco Open Steel Flooring – Shur-Site Treads • Armorgrids • Hydro Dehazers • Distillation Column Internals

Hendrick Manufacturing Co.
39 Dundaff Street, Carbondale, Pa.

Please send me your catalog on:

- ☐ H Quality Steel Perforated Plate
- ☐ Wedge Slot Screens
- ☐ Wedge Wire

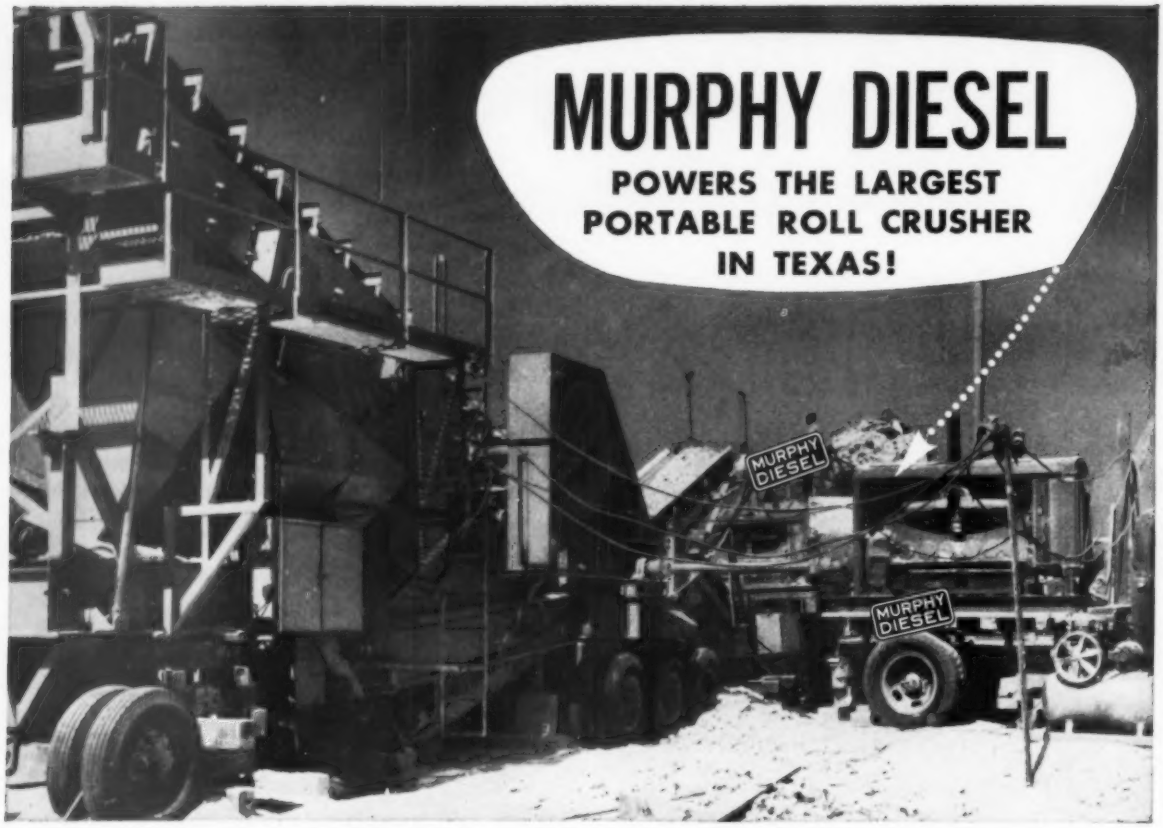
☐ I would appreciate a call from a Hendrick Sales Engineer.

Name_____

Company_____

Address_____

City_____ Zone_____ State_____



In addition to this truck-mounted Murphy Diesel shown handling the power requirements of Texas' biggest roll crusher, W. O. Pelphrey Construction Company uses a 177 HP (continuous) Murphy to power the portable primary in the background. They have a total of seven Murphy Diesels in service.

225 HP MURPHY drives a 30" x 60" Roll Crusher in W. O. Pelphrey's portable secondary plant

When it comes to heavy-duty power, you can't beat a Murphy Diesel. Ask W. O. Pelphrey of Ft. Worth about the performance of his 225 HP (continuous) Murphy, powering a secondary that's big by any standards.

Any Murphy Diesel owner will tell you the same—Murphys are built for heavy-duty service to deliver steady, more uniform power at more economical operation costs, with plenty of reserve for the heaviest demands. They start easier, run cooler, and deliver trouble-free service day after day.

Ask your Murphy Diesel Dealer about the profit advantages of Murphy power on your job.

407R0

MURPHY DIESEL

HEAVY-DUTY POWER for ROCK CRUSHING

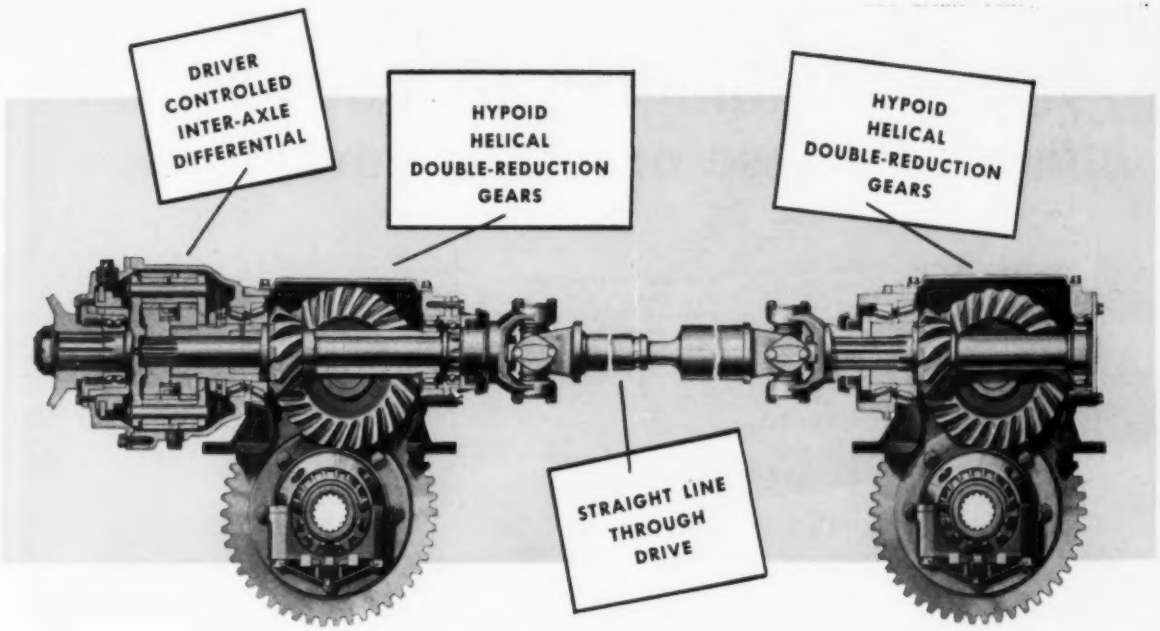
Murphy Diesel engines and power units are available in sizes from 96 to 264 H.P. with engine speeds of 1200 and 1400 rpm. "Packaged" generating units are available with capacities ranging from 64 to 165 K.W.

MURPHY DIESEL COMPANY

5307 W. Burnham St., Milwaukee, Wisconsin

SALES . . . PARTS . . . SERVICE

Throughout the Nation


DRIVER CONTROLLED INTER-AXLE DIFFERENTIAL
HYPOID HELICAL DOUBLE-REDUCTION GEARS
HYPOID HELICAL DOUBLE-REDUCTION GEARS
STRAIGHT LINE THROUGH DRIVE

Hypoid Double-Reduction Gears Make

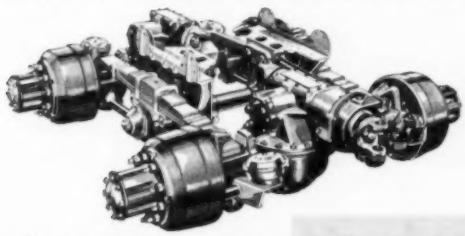
TIMKEN-DETROIT® HEAVY-DUTY TANDEMS

first in performance, long life and low maintenance cost!

Timken-Detroit Heavy-Duty Tandems with Hypoid Helical Double-Reduction Gears give you payload leadership, long trouble-free service, economical performance. Here's why –

True Double-Reduction. Two full sized gear sets form a balanced power train with each gear set accomplishing a healthy reduction. Husky hypoid first reduction gears and wide faced helical second reduction gears combine to form a rugged double-reduction drive that will outperform all others.

Widest Choice of Axle Ratios. Timken-Detroit "balanced design" full double-reduction does not limit the secondary gear set to a fixed low numerical value which depends on primary gear set for all ratio changes. The hypoid-helical gear arrangement permits a wider range of ratios because the numerical value of both the primary and secondary ratio gear sets can be varied.



Top-Mounted Straight Line Drive. Eliminates all prop shaft angularity. Bearing and gear life is increased. Maintenance costs reduced. Top-mounted position of carriers provides main drive shaft alignment – ideally suited for short wheel base trucks or tractors.

Driver Controlled Inter-Axle Differential. Divides torque equally between axles, yet compensates for any differential of speed between the axles. Both axles are always doing equal amounts of work . . . can be locked out at any speed when poor traction conditions exist.

Tough, Torsion Flow Axle Shafts Are Best By Any Test. Don't be misled . . . patented Torsion Flow Axle Shafts are still the best available to the American Trucking Industry. Comparison tests prove that Timken-Detroit Axle Shafts, spline diameter for spline diameter, are the toughest ever made.

©1959, R-S Corp.

World's largest manufacturer of axles for trucks, buses and trailers

Another Product of...

ROCKWELL-STANDARD CORPORATION

ROCKWELL R STANDARD

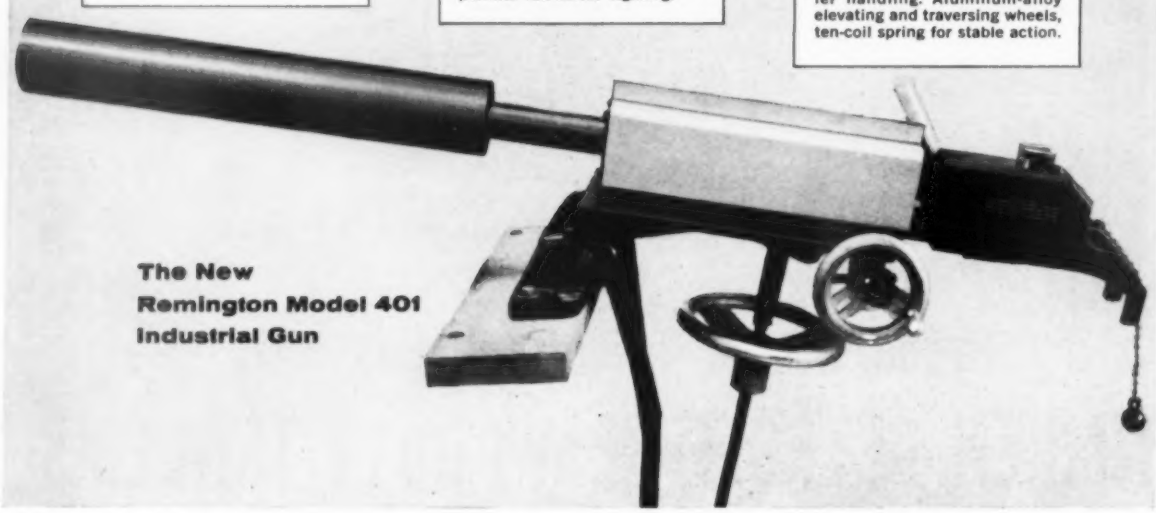
Transmission and Axle Division, Detroit 32, Michigan

New— Remington Industrial Gun
offers you these operating advantages—

NEW Built-In Muffler... reduces firing noise up to 50%. Strong, one-piece welded construction. Removable.

NEW Stellite-Lined Barrel... gives constant energy to slug, improves ejection, and gives longer barrel life. Breech design permits full-barrel sighting.

NEW Lighter Construction and Recoil Action... makes for easier handling. Aluminum-alloy elevating and traversing wheels, ten-coil spring for stable action.



The New Remington Model 401 Industrial Gun

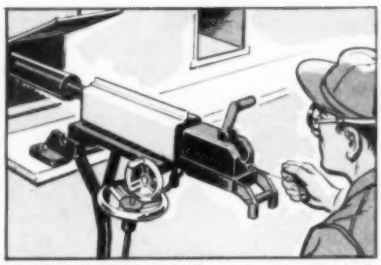
Remove clinker rings in minutes ...save time and money!

You save valuable kiln downtime and man-hours in removing clinker rings with the new hard-hitting Remington Model 401 Industrial Gun. It's designed for use in rotary kilns for cement and lime manufacture, refractories and lime-sludge operations. This newly designed gun does the work of many sledge hammers—brings rings and other troublesome kiln formations down in minutes!

No need to wait until the kiln cools off. In fact, there's no need to turn off flame or stop rotation until ready to fire. To operate, just load—aim—FIRE—and up to 9,000 ft.-lbs. of knockdown power smashes into the clinker buildup. A few well-placed shots, and rotation of the kiln will cause the ring to crumble. Then you're back on a full-time schedule!

Here's the easy, cost-saving way to remove buildups in clinker rings—without damage to kiln or lining. The new Remington Industrial Gun and one man can save you money.

For information about the advantages of this new gun and how it will help solve your problems, write to the address below.



ONE-MAN OPERATION is made more practical by the special construction of the new Remington Industrial Gun. Spade grip and special corrugated operating handle reduce strain for the operator. Safety features include provision for a protective shield which can be fitted to kiln opening to block heat and clinker fragments. Mortised breech block makes it impossible to fire when breech is not fully closed.

3 REMINGTON INDUSTRIAL SHELLS
for variety of power...

Magnum Shell—3-oz. special lead-alloy slug—delivers 9,000 ft.-lbs. of energy.

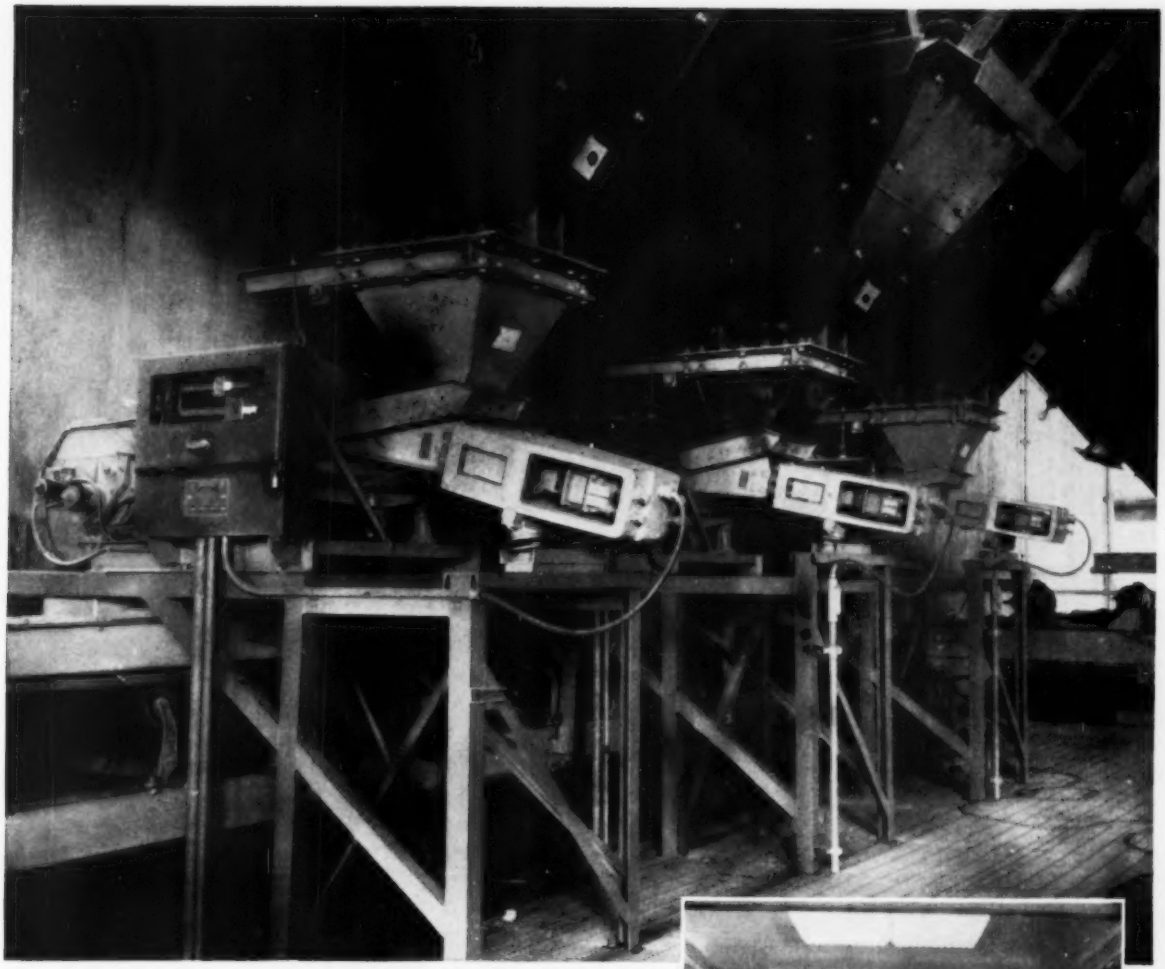
Standard Shell—3-oz. lead slug—delivers 7,500 ft.-lbs. of energy for shorter kilns.

Special Shell—2-oz. special zinc-alloy slug—delivers 7,500 ft.-lbs. of energy.

All shells now available in new easier-to-handle packing

Remington DUPONT

Remington Arms Company, Inc., Bridgeport 2, Connecticut



Jeffrey WAYTROLS® automatically proportion and feed raw materials

In this new cement plant, an automatic system incorporating Jeffrey WAYTROLS proportions and feeds raw materials. This permits mill operators to vary the rate at which the blended product is fed through process to suit requirements.

Jeffrey WAYTROLS can be used in many processes . . . can contribute to your plant efficiency. Where slurries or slimes are involved, WAYTROLS can provide accurate mix and fast low-cost processing. If just solid content is important, instruments can measure it and ignore water content.

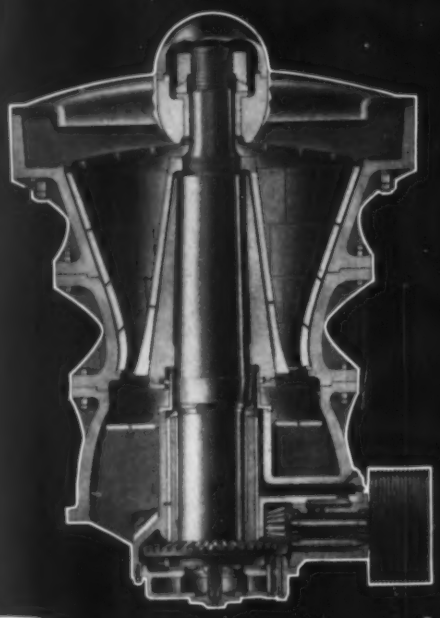
For information on how Jeffrey processing equipment can help you, write The Jeffrey Manufacturing Company, 917 North Fourth Street, Columbus 16, Ohio.

These units (upper photo) are part of a group of 10 WAYTROLS in a new cement plant. Automatic controls (below) regulate raw feed ratios and control proportioning of materials.

JEFFREY

CONVEYING • PROCESSING • MINING EQUIPMENT...TRANSMISSION MACHINERY...CONTRACT MANUFACTURING

TC GYRATORY CRUSHERS



Traylor-made for primary reduction

Traylor engineers are the world's largest builder of giant 60" Gyratory Crushers. Here are some of the reasons the Traylor TC Gyratory Crusher is so much in demand:

- A straight line bar type spider, of heavy construction—simple but strong.
- Traylor original, self-tightening, bell head and curved concaves.
- The Traylor patented dust seal. A practical and efficient device for excluding foreign matter from the lubrication chamber.
- A positive outside automatic lubrication system.
- Bronze bushed eccentric bearing with pressurized lubrication.

. . . made in 7 sizes with feed openings 20" to 60" and capacities from 1,240 to over 32,000 tons per eight hour day are in use by many leading producers throughout the world.

For specifications and capacities, send for Traylor Bulletin No. 1126.

Shown above a 54" TC Gyratory Crusher in a portland cement plant.

GYRATORY CRUSHERS • JAW CRUSHERS
Traylor
ROTARY KILNS • BALL MILLS • APRON FEEDERS

TRAYLOR ENGINEERING & MFG. CO., 1175 MILL ST., ALLENTOWN, PA.

Sales Offices: New York — Chicago — San Francisco

Canadian Mfr.: Canadian Vickers, Ltd., Montreal, P. Q.

BIG BLAST, BIG JOB, BIG AMERICAN, BIG RESULTS

When 2,100 pounds of dynamite crumbled solid limestone at the 60-year old Riverview Stone and Material Co. quarry, Florissant, Missouri, the shattering blast signaled the entry of a heavy duty American 700 Series shovel to pick up.

Stretched out under 16 to 18 feet of overburden, the stone was drilled with 30 holes, 3½ inches in diameter and 30 feet deep. The dynamite explosion brought down countless thousands of yards of work for the eager American.

With its big dipper gorging itself on busted rock, the huge shovel quickly deposited the material in a steady chain of front dumping trucks for hauling to the plant located two blocks away . . . from there to streets, driveways and parking lots.

On this job, as in countless other pit and quarry operations, American shovels set a steady production pace . . . get the job done quicker. American's 700 makes the operator's work easier, too, because its superior air control system eliminates hard to handle levers. Anti-friction bearings in the brake linkage relieves operator fatigue by cutting his leg work 60%.

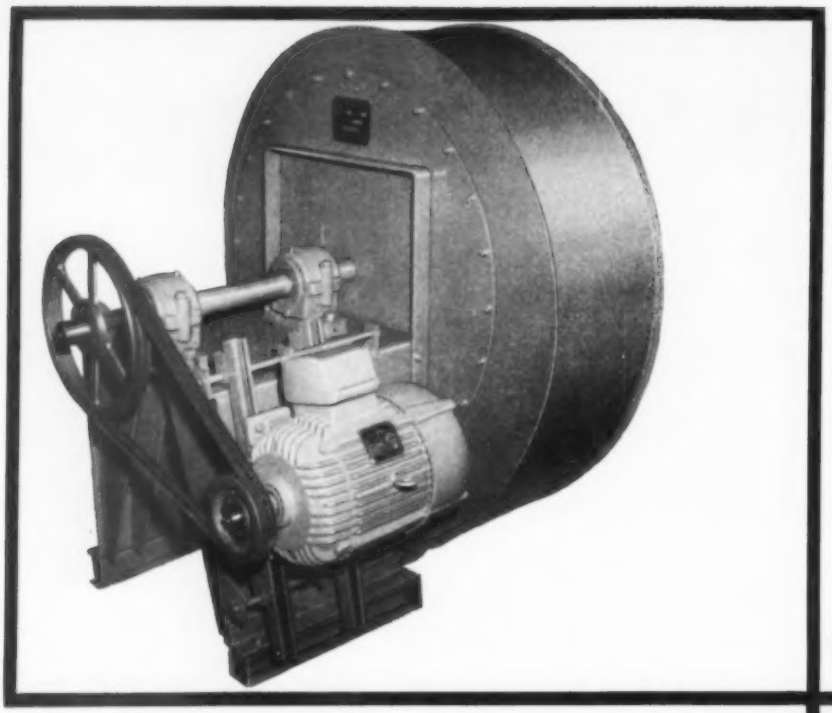
SEE FOR YOURSELF why the American 700 crane-excavator is in a class by itself. Contact your American distributor for complete detailed and illustrated catalog information.

EXCAVATORS-CRANES to 2 yds.-60 tons
LOCOMOTIVE CRANES to 130 tons
DERRICKS-HOISTS to 800 tons
REVOLVER CRANES to 400 tons

AMERICAN HOIST
and Derrick Company
St. Paul 7, Minnesota

AMERICAN HOIST PACIFIC COMPANY
Special materials handling equipment

CROSBY-LAUGHLIN DIVISION
Drop forged fittings for wire rope-chain



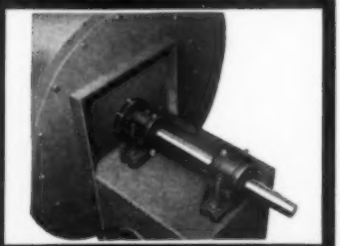
From Rugged Hot Gas Applications To Tough Materials Handling Jobs...

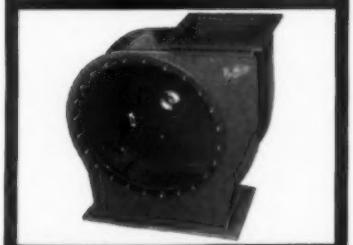
"BUFFALO" EXHAUSTERS CAN TAKE IT!

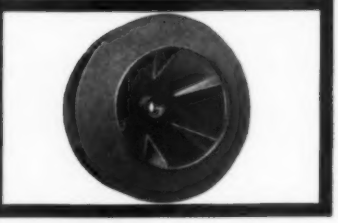
"Buffalo" Industrial Exhausters are ruggedly built, highly efficient heavy duty fans designed for a wide variety of applications. Husky steel plate housing is welded throughout. Adjustable to any discharge direction. Reversible for clockwise or counter-clockwise rotation. Available in numerous arrangements for many severe air and materials moving jobs. These include:

- **Moving Hot Gases** — 200° F. to 850° F. For this purpose units are equipped with heat slingers, high temperature ball bearings and/or separated steel bearing subbase.
- **Handling Corrosive Fumes.** Installations have proved that "Buffalo" Rubber-Lined Exhausters will outlast metal fans up to twelve to one. Rubber is vulcanized directly to all metal parts exposed to acid fumes.
- **Materials Moving.** Type "MW" material wheels are available for moving emery dust, saw dust, chips, long shavings and many other types of materials.

Investigate the advantages of "Buffalo" Industrial Exhausters for your severe air or materials moving jobs. Phone your "Buffalo" engineering representative, or write for Bulletin FI-110.







Upper: Heat Slinger for cooling shaft and bearings on a "Buffalo" Hot Gas Exhauster.

Center: "Buffalo" Rubber-Lined Exhauster for corrosive fume handling.

Lower: "Buffalo" Type "MW" Material Wheel.

BUFFALO FORGE COMPANY
Buffalo, N. Y.

Buffalo Pumps Division • Buffalo, N. Y.
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You may wish to refer to the Rollway Catalog and Engineering Data Book when writing specifications for a high precision bearing. It contains the first listing, by any manufacturer, of the thrust capacities of cylindrical radial roller bearings. Send for it today.

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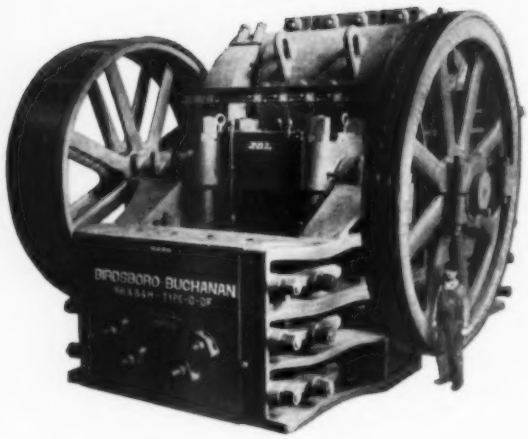


Birdsboro-Buchanan Crusher Utilized at Kaiser Steel's Eagle Mountain Mine

• A giant 66" x 84" Birdsboro-Buchanan crusher is being used to meet current production quotas for primary crushed iron ore at Kaiser Steel Corporation's Eagle Mountain, California, Mine. The iron ore will feed the West Coast's only blast furnaces.

The crusher is of an advanced deep-frame design with longer swing jaw for faster crushing to small sizes. A Birdsboro representative can tell you about the progress of this crusher installation, as well as hundreds of others, many in operations just like yours. *Sales Department, Engineering Department and Mfg. Plant:* Birdsboro, Pa., *District Office:* Pittsburgh, Pa.

Canadian Representative & Manufacturer: John Inglis Co., Ltd., Toronto, Canada.

World-Wide Agent Representation. Contact home office for nearest representative.

CR 23-58

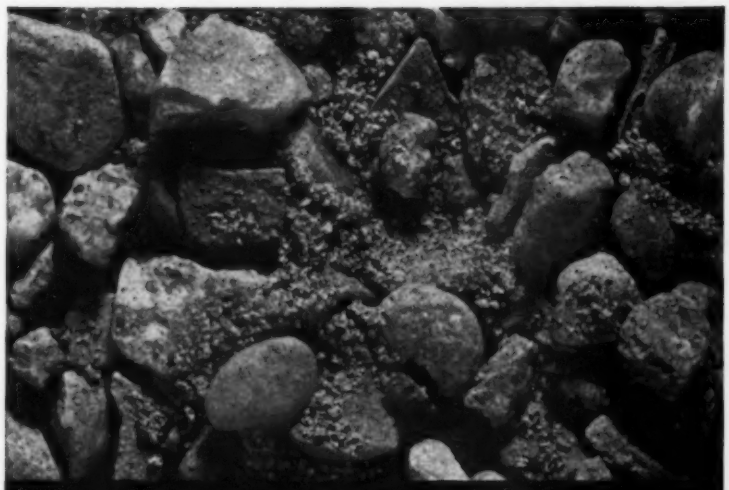
BIRDSBORO

STEEL FOUNDRY AND MACHINE CO.

STEEL MILL MACHINERY • HYDRAULIC PRESSES • CRUSHING MACHINERY • SPECIAL MACHINERY • STEEL CASTINGS • Weldments "CAST-WELD" Design ROLLS: Steel, Alloy Iron, Alloy Steel

AGGREGATE IS JUST SAND AND GRAVEL...

UNTIL WEMCO ENTERS THE PICTURE...



Today, you don't turn a sand and gravel deposit into real profits—unless you have a low-cost, volume operation—and a quality product!

So it is that so many operators turn to WEMCO for the shortcuts to sound, economical production. Through nearly 20 years' of experience in the aggregate industry, WEMCO has pioneered methods, engineered the equipment that consistently has been able to upgrade deposits to acceptable, marketable specifications. The WEMCO MOBIL-MILL, for example, is the first pre-fabricated, packaged heavy media separation plant, complete and ready for installation and operation; requires no additional labor, produces premium aggregate the first day! A complete line of other WEMCO EQUIPMENT for preparation, beneficiation and handling of aggregate, too, is available.

We'll be glad to furnish details on how WEMCO can work profitably for *you!*

A WEMCO man can give you details on getting the most out of your operation. Why not call him today?

WEMCO

a division of
Western Machinery Company, *Dept. P. Q.*
650 Fifth St., San Francisco, Calif.
and throughout the world

540,000 gallons of water used daily by sand and gravel plant!

MARLOW supplies water to meet full requirements

To supply water for their Pioneer and Simplicity washing and screening plant, the Nello L. Teer Company, Erwin, N. C., uses a Marlow 6G3S pump powered by an International-Harvester engine. The pump, located on the bank of a river, carries the water up a steep hill to the plant, a half mile away. On continuous operation, the pump delivers 54,000 gallons per hour, but *can* handle up to 66,000 gallons per hour during peak periods!

Fred Byrd, Superintendent of Operations for the Teer Company, said that the plant has a capacity of 1,400 tons per 10 hour day and uses 540,000 gallons of water. The plant produces sand and gravel up to 1¼ inches in diameter and is used on their own construction jobs as well as sold commercially to other construction firms. Serving the washing and screening plant is an Eagle Screw, Barber Green Conveyor Belts and a Telsmith Gravel Crusher.

Mr. Byrd is well pleased with the performance of his Marlow pump. He says it runs 10 hours a day without interruptions and gives him all the water he needs to meet his requirements.

Let Marlow help you solve your pumping problem. Write today for information on the complete line of A.G.C. rated pumps and famous Marlow Mud Hogs for handling muddy and trash-laden water. Ask for Bulletin CO-4 and the name of your nearest Marlow dealer.

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DIVISION OF

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HEAVY DUTY HYDRASTROKE* FEEDER

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PATENT APPLIED FOR

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  eliminates wear due to friction, needs no lubrication, takes minimum head room.
- **WIDE RANGE OF SIZES**
  widths from 36" to 96", feeding capacities from 200 to 7500 tons per hour.

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SUBSIDIARY OF PETTIBONE MULLIKEN CORP., CHICAGO 51, ILLINOIS

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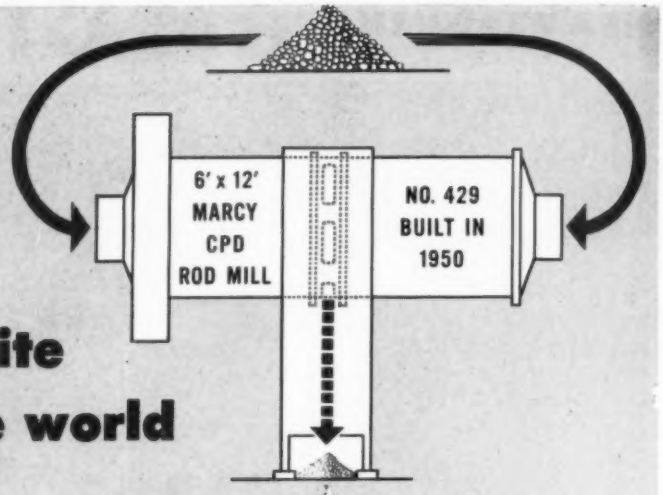
Best by a dam site anywhere in the world



This World Traveler...

Provided Specification Sands for

LOOKOUT POINT DAM, Lowell, Ore., 1950

Photo courtesy Corps of Engineers, U. S. Army

Constructed and operated by the Corps of Engineers, U. S. Army, Portland District, for flood control and power. This earth and concrete dam, and the Dexter Dam, a reregulating unit, required 996,000 cu. yds. of concrete. Contractors were Morrison-Knudsen, Peter Kiewit Sons Co., and Macco Corporation.

Provided Specification Sands for

TABLE ROCK DAM, Branson, Mo., 1954

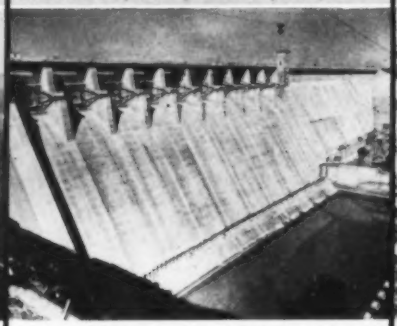


Photo courtesy Corps of Engineers, U. S. Army

Constructed and operated by the Corps of Engineers, U. S. Army, Little Rock District, for flood control and power. 1,300,000 cu. yds. of concrete were involved on this earth-concrete structure. Morrison-Knudsen Co., Inc., and Utah Construction Co. were the contractors.

Will Provide Specification Sands for

KARADJ DAM, Teheran, Iran, 1958

Scheduled for completion in 1961 this dam will be 590 ft. high, one of the ten highest concrete dams in the world, and will require 915,000 cu. yds. of concrete. It will be a source of city water supply, power and irrigation. Harza Engineering Co. International prepared plans and specifications. Morrison-Knudsen Co., Inc., was awarded the contract by Iran. An 8' x 12' Marcy CPD Rod Mill is also on order for this project.

Morrison-Knudsen purchased this 6' x 12' Marcy CPD Rod Mill in 1950 for use in producing specification sands for the Lookout Point Dam; moved it to their job on the Table Rock Dam; and will use it, along with an 8' x 12' Marcy CPD Rod Mill, on Iran's Karadj Dam.

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Only Austenitic manganese steel withstands the jolting wear of shovel and bucket parts. And your top source for this rugged material is Columbia Steel Casting Company, where craftsmanship, know-how, and 60 years experience combine to give you better design, longer wear, and greater efficiency. Columbia Armor-Tough bucket and shovel parts will save you many dollars in long life and superior efficiency. Specify Columbia.

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Typical Feedoweight installation showing hopper arrangement and control cabinet.

For Automatic Feeding, Blending and Proportioning of Bulk Materials by Weight the Merrick FEEDOWEIGHT®

This remarkable machine provides precise, uniform control of the rate of feed of bulk materials by weight. Used by the chemical, cement, pulp and paper, mining and other industries in blending, mixing and proportioning, the Feedoweight utilizes a powered feed regulator controlled by the scale beam to increase or diminish the flow of material. A continuous, running total of the weight of the material fed is also provided.

The Feedoweight is available in a range of models and tonnage capacities to suit any application. Write today for bulletins describing its operation and application.

Fifty years of "firsts" in automatic weighing

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180 Autumn Street • Passaic, N. J.

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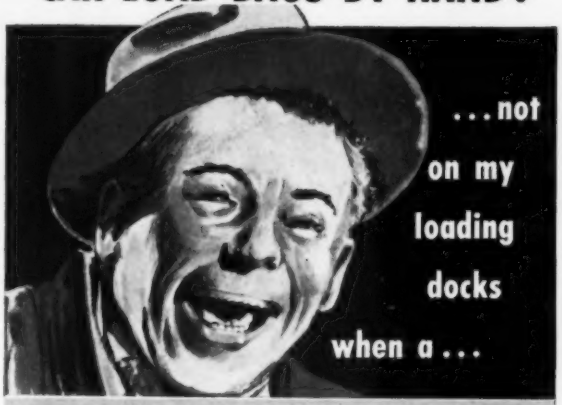
CAR LOAD BAGS BY HAND?



POWER-CURVE automatic installation will show me a healthy saving in *just one season!*

POWER-CURVE makes a quick payout on cement, loading without physical lifting, without interruption and *with just one man . . .* replaces a steady parade of hand trucks and labor. POWER-CURVE will flatten filled bags, route them to storage or to the dock, fill box cars or trucks from end-to-end and to full height neatly stacked against transit damage. POWER-CURVE can transfer, elevate, sort and select. It can unload, convey mixed loads, palletize and economize! It is used by virtually every major cement company in one or more plants. It is self-powered, mobile, fully flexible and variable in height . . . Write for information tailored to your requirements, no obligation.

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Lone Star Cement Corp.
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Union Carbide Corp.
U. S. Gypsum Company

POWER-CURVE
CONVEYOR COMPANY
2185 SOUTH JASON ST., DENVER 23, COLORADO

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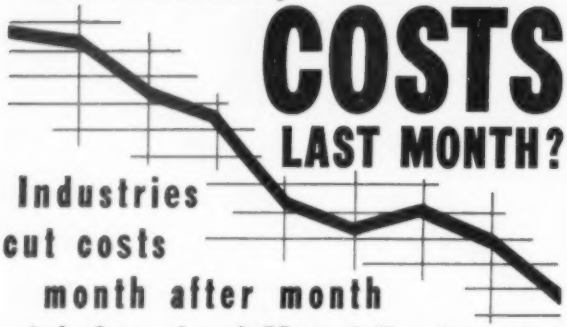
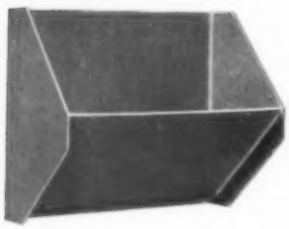
WHAT WERE YOUR CONVEYING / ELEVATING COSTS LAST MONTH?

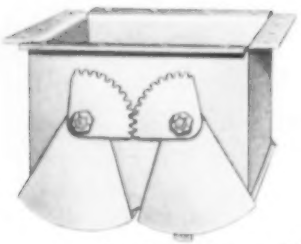


Industries cut costs month after month with Standard Metal Equipment



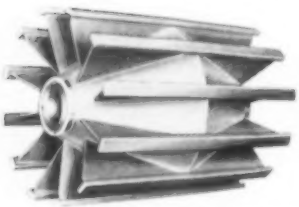
STANDARD METAL'S CONTINUOUS ELEVATOR BUCKET STYLE No. 2

This long-life bucket resists wear — delivers outstanding service and economy under severest conditions. This style is just one of the complete line of low-cost, rugged steel buckets manufactured by Standard Metal. Available in Salem, Style "A" and other continuous style buckets.



STANDARD METAL'S BIN GATES

Here's the all-steel, gear-operated Duplex Bin Gate for faster, easier material handling at minimum cost. Now supplied standard with twin bracket at bottom of gate, drilled to accommodate bolt for fulcrum lever. Single Bin Gates by Standard Metal also available.



STANDARD METAL'S WING-TYPE SELF-CLEANING PULLEY

Includes Taper-Lock Split Bushing to save time and trouble when mounting shaft. These pulleys are light in weight, yet their all-steel welded construction resists breaking, and delivers many years of trouble-free, low-cost service. Also available with solid hubs bored to specifications.

Contact us for full details and quotations on your particular needs in elevating and conveying equipment—for new installations or replacements. Ask for the catalog showing the complete Standard line.

The Standard Metal Mfg. Co. SINCE 1921

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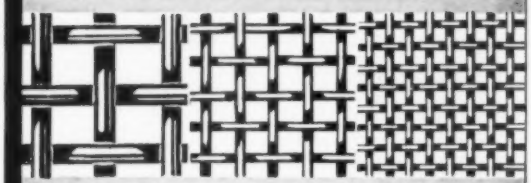
STRONG AS ARMOR
NAT-ALOY
Woven Wire Screens



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... NO WASTED ENERGY!

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SINCE 1910

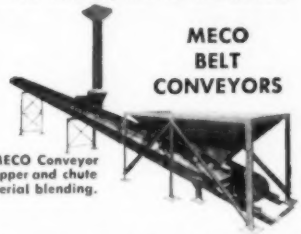
. . . the answer to your
CONVEYOR
and
ELEVATOR
PROBLEMS

Whatever the characteristics of the materials to be handled . . . the need for equipment which will withstand hard and constant service . . . the limitations of space . . . MECO can supply the answer to your conveyor and elevator problems!

MECO Conveyors and Elevators are designed, engineered, and manufactured *to your specific requirements and application*—embody all the features and advantages gained in nearly one-half century of experience in the design and manufacture of material handling equipment.

MECO Conveyors and Elevators are your assurance of efficient, economical operation and long years of reliable, trouble-free service.

MECO BELT CONVEYORS



MECO Conveyor with hopper and chute for material blending.

MECO Conveyors are designed for the efficient handling of practically all bulk materials; light or heavy; wet or dry; granular or lumpy. The available width of belts, the many kinds of material that may be handled, and the varied permissible speeds at which they may operate, combine to produce a broad range of capacities. MECO Conveyors can be made to operate over short or long distances; horizontally or on inclines. All idlers and pulleys are balanced. Belt idlers have smooth surfaces and rounded edges to prevent damage and provide for longest belt life. Available as complete units with framing, or in component form for purchaser assembly.
Write today for Bulletin No. 576

MECO BUCKET ELEVATORS

MECO Bucket Elevators are available for handling crushed or ground materials, either as Continuous Bucket or Centrifugal discharge types; chain or belt. Especially designed to withstand rugged and prolonged service requirements, MECO Elevators are furnished with solid steel head pulleys and extra heavy-duty slatted steel self-cleaning tail pulleys. Where housings are furnished, convenient outlet doors are provided for removing material accumulation. All MECO Elevators are powered through compact torque arm drives.
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MECO Centrifugal discharge Elevator, feeding conveyor.

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FILTER BAGS? WE KNOW MOST (NOT ALL)* OF THE ANSWERS . . .

As one of the world's leading manufacturers of industrial textiles, Albany Felt Company is in the best possible position to analyze your filter bag needs — and meet them effectively and economically. Since we can furnish any fiber, in any fabric, our recommendations are completely impartial.

It pays, in every sense of the word, to call in the company that is:

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3. **a start-to-finish producer of almost every type of filter bag for every purpose, in every industrial field**
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INDUSTRIAL FABRICS DIVISION
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INDUSTRIAL FABRICS DIVISION
ALBANY 1, N. Y.

☐ Please send us your latest Filter Bag bulletin.

☐ Have your representative call to supply us with a free, scientific analysis of our filter fabric requirements.

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COMPASS
points the way

St. Lawrence Sets Record

Canada has set a North American record in cement operations.

St. Lawrence Cement Co. in Clarkson reports the first of its two cement kilns has been in continuous operation for two years. No brick has been replaced in its burning zone, the company said, and the kiln is still operating. Usually, kilns run for about six weeks, then are closed down temporarily.

St. Lawrence says one of the most important contributing factors was the fuel burned and reported 120,000 tons per year of West Virginia coal was supplied by Weaver Coal Co.

The kiln is the largest in Canada and the firm is the second largest in the country. It is involved in the construction of a 5,000,000 barrel plant near Detroit, Michigan.

Reprinted from the Toronto GLOBE & MAIL, March 16, 1959

COMPASS, 100 per cent washed and 100 per cent Thermally Dried Pittsburgh Seam coal was burned exclusively during the 2-year period of this record-breaking performance.

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Top flight design engineer, mechanical, to head department of large Canadian construction organization. Preference given to applicants with experience in design and operation of cement plants, permanent and portable stone crushing plants, asphalt plants, ready-mix concrete plants, and all types of roadbuilding equipment. Must have engineering degree, or equivalent. Permanent position. Salary commensurate with ability. Give age, details of experience, references, and state salary expected. All replies confidential.

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44 Ton Gen. Elec. Diesel Elec. Loco.
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Multi plant cement company needs engineer. Opportunity for training and advancement. Give full details on background. Replies confidential.

Box No. PQ-201-F, c/o Pit & Quarry Publications
431 So. Dearborn St. Chicago 5, Illinois

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Large cement company needs master mechanic. Must have supervisory ability and be familiar with machine shop operations. In reply, give experience, references, and salary desired. Replies confidential.

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Plant Layout
Appraisals

QUARRY EQUIPMENT

Cedarapids 1236 twin jaw crusher.
Cedarapids 6C, 1236 twin jaw portable secondary.
Cedarapids 2033 hammermill. Slightly used.
Williams No. 40 Slugger Type Pulverizer.
Telsmith 36" gyrasphere crusher.
26"x8'4" apron feeder with drive.
Robins 4' x 9' tripie deck screen.
Pioneer 4' x 8' double deck screen. Rebuilt.
Cedarapids 30-8, 3-compartment charging hopper, apron feeder, bucket elevator. New.
Smitheo 10' x 10' single compartment bin.
27½ ton, single-compartment 8' x 12' bin.
1—Eagle 36"x20' double log washer. Good.
Wemco 24"x13' sand preparation machine. Good.
60-ton, two-compartment, 8' x 18' storage bin with clam gates.
100-ton, two-compartment, 13" x 23' bin.
Special bins to your specifications.
Conveyors—18"—24"—30"—36". Also conv. belting.

SHOVELS AND CRANES

P&H 855B-LC 2-yd. diesel dragline.
P&H 655B 1½ yd. diesel dragline. Reconditioned.
Lorain L-26, ⅝-yd. diesel dragline. Excellent.
Lorain L-25A, ⅝-yd. gas backhoe.
Lorain L-25K, ⅝-yd. gas crane.
Lorain TL-25, ⅝-yd. diesel basic machine.
Lima 34 Paymaster ⅝-yd. diesel shovel. Good.
Unit 1020 ⅝-yd. diesel powered shovel.
Koehring 304, ⅝-yd. diesel shovel-backhoe.
P&H 255A, ⅝-yd. diesel clam-crane.
Unit 614 ½-yd. diesel backhoe. Good.
Bucyrus-Erie 10B, ⅝-yd. gas shovel-backhoe.
American 100, ½-yd. gas clam-backhoe.
Lorain MC-414, 20-ton Moto-Crane. Reconditioned.
Lorain TL-20, ½-yd. Diesel Backhoe.
Link Belt HC-90, 25-ton truck crane.
Michigan TLDT-20, 20-ton truck crane.
Lorain MC-110, 10-ton gas Moto-Crane.
Lorain MC-4 15-ton gas Moto-Crane.
Lorain SP-107, 7-ton, self-propelled Crane.

TRACTORS, TRUCKS, SCRAPERS, ETC.

1—Wuelld TS-18, 18-yd. twin engine scraper.
2—Euclid 12-yd. overhung engine scrapers.
1—Euclid 7-yd. overhung engine scraper.
1—Euclid 15½-yd. six wheel scraper.
2—Euclid 13-yd. bottom dumps. Good.
2—Euclid 80FD, 15-ton rear dumps.
1—Euclid 18FD, 15-ton rear dump.
1—Mack LRS 15-ton rear dump. Rebuilt.
2—Allis Chalmers TS-360 15-yd. overhung engine scrapers.
1—International TD-18 with cable bulldozer blade.
1—Euclid tractor with 3200 gal. water tank semi-tlr.
1—Caterpillar D-8 with hydraulic angle dozer blade.
1—Caterpillar D-7 with bulldozer, crane boom.
1—Caterpillar D-7 with hydraulic angle dozer blade.
1—Caterpillar D-8 with push block.
1—Caterpillar D-4 TRACTOR ONLY.
1—International 300 tractor, with loader, backhoe.
1—Allis Chalmers HD-19 with cable bulldozer.
1—Wough HR, 1-yd. gas front end loader.
1—Caterpillar 12 diesel grader.
1—LeTourneau Super C Tournadozer. Excellent.

SHOVEL ATTACHMENTS

Lorain 82 or 820, 2-yd. 23' boom, 20' stick.
Osgood 903, 2-yd., 24' boom, 20'6" stick.
Lorain 26, ¾-yd., 19' boom, 16' stick.

BACKHOE ATTACHMENTS

Lorain 56, 23' boom, 7' stick, 48" bucket.
Lorain 72, 25' boom, 9' stick, 54" bucket.

GENERATOR SETS

Universal 5KW, D.C., 1200 RPM, 220-250 volts.
Century-Waukesha 15 KW, 1200 RPM, 3/60/127-220.
Century-Continental 15 KW, 1200 RPM, 3/60/120-208.
Cummins 25 KW, 1200 RPM, 3/60/120-208.
Caterpillar 40 KW, 1200 RPM, 3/60/220/440.

DIESEL POWER UNITS

Cat. D7700, 74 H.P. at 1000 PFM. Rebuilt.
Cat. D13000, 128 H.P. at 1000 RPM. Rebuilt.
GM 3021C, 3-cylinder, new.
GM 671, 6-cylinder. Rebuilt.
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CRANES: WB2 Browning Wagon, 20, 30 & 60 ton Bridge, 60 ton Brownhoist Locomotive.
36"x20' dbl. Log WASHERS. Telsmith 2 screw.
MILLS: Raymond 5047. Dixie 2424 non-clog, 3650 std. 3636 Jeffrey, Stedman 2918 Hammer.
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BATCHING PLANT: One complete batching plant including 5 cu. yd. aggregate batcher, 4 compartment bin with cement bin and 600 bbl. ground storage silo, bucket elevator, air compressor, etc., with or without 50 TPH under track screw for unloading cement.

OVERHEAD ELECTRIC TRAVELING CRANES: Two 25 ton capacity, 37'2" span, 440 volt, 3 phase, 60 cycle, modern late type roller bearing equipped.

JAW CRUSHERS: 18 x 30, 30 x 42, 40 x 42, 48 x 60, 56 x 72, all steel, with or without motors and controls.

REDUCTION CRUSHERS: Symons 4 ft. Short Head; one 4 ft. standard and one 2 ft. standard.

CLASSIFIERS: One Akins and one Wemco 78" x 36 ft., duplex spiral, with motors and drive, condition like new.

AIR SEPARATORS: Sturtevant and Gayco 14 ft. and 16 ft.

HAMMER MILL: 350 tons per hour, 6 to 10" material down to 1¼" product.

HARDINGE CONICAL BALL MILLS: 8 x 36 and 8 x 48 complete with 2200 volt motors.

BELT CONVEYOR: 42" x 850 ft. complete with all mechanical and electrical parts, with or without belt.

BUCKET: Williams 1¼ yd. clam shell, material handling.

HOISTS: Lidgerwood single drum 7' dia., 5'3" face, 32,000 lbs. pull, 1⅝" rope, 250 or 450 FPM, 150 or 250 H.P. One single drum Nordberg 5' dia., 5' face, 1⅛" rope, 100 H.P., 750 FPM. One Nordberg double clutched drum 10' x 10', 1½" rope, 1250 H.P., 1200 FPM. All the above with post brakes, Lilly controls, 2200 volt motors and controls. Other hoists 100 H.P. to 2500 H.P.

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For further information call

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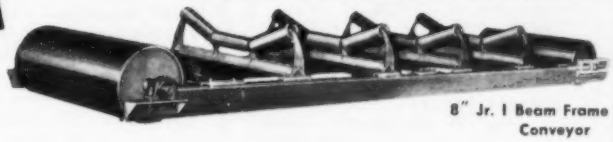
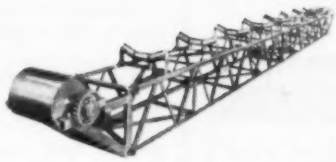
BONDED QUALITY BARGAINS

BONDED ® TROUGHING IDLER CONVEYOR BARGAINS



8" Jr. I Beam Frame Conveyor

Truss Frame Conveyors



- Built Like A Bridge
- For High Tonnages
- Clear Spans To 50 Ft.
- Any Length - Any Belt Width

Complete Pre-Fab sections of 8" Jones and Laughlin Jr. I Beam Frame Conveyor, quickly and easily joined together on the job. These beams are rolled with .20% Copper Content. Atmospheric exposure tests disclose that Junior Beams, with .20% Copper have as much as four times the resistance to corrosion as non-copper metals. They are braced with structural angle, welded to frame for maximum rigidity and compactness. Conveyors are equipped with 5" roll diam. idlers and return rolls. 20" diam. head pulley and 16" diam. tail pulley mounted on 2¼" or 2-7/16" diam. shaft. We take our loss on our stock of short length belting. You can save as much as 50% on the BONDED CONVEYOR SPECIALS, with conveyor belting in two pieces. Belt is new 4-ply 28-oz. duck, ⅛" top rubber cover x 1/32" bottom cover and is fresh stock guaranteed to meet or exceed listed specifications.

BONDED TROUGHING IDLER CONVEYORS ALSO IN TRUSS FRAME CONSTRUCTION AT SLIGHTLY HIGHER PRICES

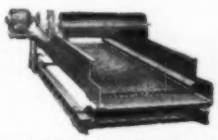
CONVEYOR PRICES INCLUDE BELTING

Belt Width	Length of Conveyor	List Price	Sale Price	Belt Width	Length of Conveyor	List Price	Sale Price
14"	25'	$1397	$ 738	14"	50'	$2222	$1159
14"	85'	3377	1748	14"	125'	4697	2423
16"	20'	1262	667	16"	45'	2137	1118
16"	60'	2662	1388	16"	90'	3712	1930
18"	25'	1477	797	18"	45'	2217	1182
18"	70'	3142	1663	18"	85'	3697	1952
18"	100'	4252	2240	18"	130'	5362	2817
20"	25'	1517	835	20"	60'	2882	1548
20"	75'	3467	1854	20"	90'	4052	2159
24"	25'	1590	898	24"	45'	2430	1334
24"	70'	3480	1878	24"	100'	4740	2532
24"	120'	5580	2967	24"	150'	6840	3621
30"	50'	2911	1617	30"	70'	3871	2112
30"	90'	4831	2607	30"	140'	7231	3845
36"	25'	1818	1118	36"	45'	2585	1677
36"	60'	3638	2096	36"	100'	5718	3214

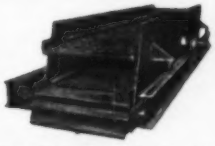
For conveyors longer or shorter than those listed above, add or deduct the following per foot prices according to belt widths. Prices include belting.

For 14" belt, add $16.84 per foot;
For 16" belt, add $18.04 per foot;
For 18" belt, add $19.24 per foot;
For 20" belt, add $20.37 per foot;
For 24" belt, add $21.78 per foot;
For 30" belt, add $24.75 per foot;
For 36" belt, add $27.95 per foot.
WRITE FOR BULLETINS #1138 AND #1189.

BONDED ® GENERAL DUTY AND HEAVY DUTY VIBRATING SCREENS



More than 7000 Mines and Quarries have modernized with Bonded Equipment



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PERFECT BALANCE AND SHARP ACTION. Eccentric weight mechanism, spring mounted. 1 to 3 decks, 2' x 4' to 3' x 8'. **WRITE FOR "SEVEN SECRETS OF SUCCESSFUL SCREENING" IN BULLETIN NO. 1086. #1086.**

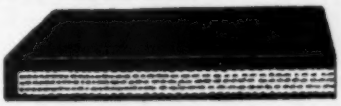
Model Number	Screening Area	No. of Decks	Sale Price
124A	2'x4'	1	$ 443
224A	2'x4'	2	472
126A	2'x6'	1	472
226A	2'x6'	2	501
134A	3'x4'	1	504
234A	3'x4'	2	570
136A	3'x6'	1	581
236A	3'x6'	2	688
336A	3'x6'	3	956
138A	3'x8'	1	675
238A	3'x8'	2	815
338A	3'x8'	3	996

FACTORY BALANCED, CONTROLLED VIBRATION. Four bearing positive throw eccentric shaft; 3' x 6' to 5' x 14'. 1 to 5 decks. **WRITE FOR BULLETIN NO. 1087 AND 9 REASONS WHY BONDED IS YOUR BEST BUY.**

Model Number	Screening Area	No. of Decks	Sale Price
336B	3'x6'	3	$1620
436B	3'x6'	4	1885
138B	3'x8'	1	1510
238B	3'x8'	2	1620
338B	3'x8'	3	1735
248B	4'x8'	2	2310
348B	4'x8'	3	2440
2410B	4'x10'	2	2400
3410B	4'x10'	3	2550
2412B	4'x12'	2	2590
3412B	4'x12'	3	2970
4412B	4'x12'	4	3165

TESTED CONVEYOR BELTING* AT NEW LOW PRICES

WE PAY FREIGHT ON 200 POUNDS OR OVER



Major Brand: 12# to 15# Average Friction Pull. 800# to 1000# Average Cover Tensile. Heavy Duty 4-ply, 28-oz. duck, ⅛" top rubber cover x 1/32" bottom rubber cover belting having high tensile strength, tough cotton duck, strong carcass and proper flexibility. For heavy boxes, bags and bulk materials. Troughs easily. Famous brands at deep cut prices. Fresh stocks.

Width	Ply	List Price Per Ft.	Sale Price Per Ft.
14"	4	$5.63	$2.83
16"	4	4.08	2.97
18"	4	4.51	3.29
20"	4	4.97	3.80
24"	4	5.85	4.26
30"	4	7.18	5.21
36"	4	8.51	6.18

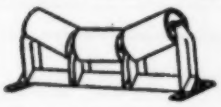
Major Bee Brand: 16# to 19# Average Friction Pull, 2400# to 3000# Average Cover Tensile. Skim coat between plies. A high grade of heavy duty 4 and 5-ply, 28 oz. duck, ⅛" top rubber cover x 1/32" bottom rubber cover. These belts are for more severe service, high tonnages and abrasion resistance. For handling stone, mineral ores, concrete, cement, coal, and other similar materials, both wet and dry. Belts have molded rubber edges.

Width	Ply	List Price Per Ft.	Sale Price Per Ft.
14"	4	$4.31	$3.06
16"	4	4.85	3.46
18"	4	5.39	3.83
20"	4	5.90	4.37
24"	4	6.94	4.94
30"	4	8.53	6.07
36"	4	10.09	7.35
24"	5	8.14	5.78

*All belting is tested by the Engineering laboratory of one of the largest universities in the United States. It is guaranteed to meet or exceed listed specifications.

Other widths, plies, duck weights and cover thickness available at low prices. **WRITE FOR SAMPLE AND BULLETIN #1234.**

BONDED® IDLERS & RETURN ROLLS SAVE 25% AND MORE



3-roll, 5" diameter Troughing Idlers for:

14" belt	$19.75	24" belt	$22.75
16" belt	20.50	30" belt	23.85
18" belt	21.90	36" belt	24.90
20" belt	22.10	48" belt	27.50

1-roll, 5" diameter Return Rolls for:

14" belt	$ 8.50	24" belt	$11.00
16" belt	9.00	30" belt	12.50
18" belt	9.50	36" belt	13.75
20" belt	10.00	48" belt	16.50

All steel. Interchangeable with other well-known makes. Furnished with replaceable prelubricated sealed ball bearings. Maintenance is negligible. **WRITE FOR BULLETIN #1138.**

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110 BELLEVUE — **Mfrs. of Scales, Conveyors, Conveyor Parts, Idlers, Vibrating Screens, Crushers and Feeders** — **COLUMBUS 7, OHIO**

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25-Ton, 45-Ton, 80-Ton, 100-Ton, General Electric

HARDINGE MILLS
6' x 36" (2)

BALL MILLS
4½' x 5' Allis Chalmers
4' x 5' Miners Foundry
Nos. 56, 77 & 96 Marcy

TUBE MILLS
6' x 28' & 7' x 24' Allis Chalmers
7' x 18' Patterson 2 Compartment
7' x 35' Traylor 3 Compartment

ROD MILLS
5' x 10' Kennedy Van Saun
7' x 15' Marcy

HAMMERMILLS
24" x 18" Jeffrey Type A
24" x 20" Jeffrey Type B-2
30" x 48" Gruendler Model 2XE
Size 8 Williams Jumbo 350 H.P.

JAW CRUSHERS
14" x 28" New England Road Mach.
10" x 36" America Good Roads
10" x 16" New Pioneer
24" x 36" Pioneer
30" x 36" Traylor Type H
42" x 40" Allis Chalmers
56" x 72" Traylor Style G
36" x 42" Farrell Bacon

ROLL CRUSHERS
42" x 18" Traylor Type AA
24" x 16" Cedar Rapids
42" x 16" AA & 42" x 16" B-Allis Chalmers

PORTABLE CRUSHING PLANTS
1—Model 2A Cedar Rapids Secondary 40 T.P.H.
1—Cedar Rapids Comander 150/200 T.P.H.

CAR PULLERS
2—Size 12 Stephen Adamson 10 H.P. 3/60/220/440

FEEDERS
3—Model F.-45 & F-55 Syntron Grizzley Pans.

GYRATORY CRUSHERS
10" Allis Chalmers Superior McCully
No. 6 McCully
17" Kennedy Van Saun Gearless
16B Telsmith
20" Allis Chalmers Superior McCully
25B Telsmith
No. 11 McCully

CONE & FINE REDUCTION CRUSHERS
No. 1 Sturtevant
No. 122 Allis Chalmers Hydrocone
2' Symons Standard
No. 19 Kennedy Van Saun
3' Symons Standard
4'6" Traylor Type TY.
4¼' Symons Standard
350 H.P. Bradley Improved Mills

VIBRATING SCREENS
4' x 8' x 5' x 10' Symons Rod Deck
3' x 10' Telsmith Double Deck
5' x 14' Simplicity Triple Deck
6' x 20' Hewith Robins Double Deck—"Hi-G"

ROTARY DRYERS
36" x 20 Ruggles Coles Class XF-1
5' x 30' Ruggles Coles Class XA-8

ROTARY KILNS
6' x 125' Vulcan

CLASSIFYING EQUIPMENT
No. 3 Wemco HMS Plant
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1—Allis Chalmers 4' x 40'.
1—Allis Chalmers 4' x 30', ⅜" shell.
2—Ruggles Cole 4' x 20', ⅜" shell.
1—Link Belt Roto Louvre Dryer, 3'10" x 20'.
1—34" x 30', 5/16" shell.
1—Traylor 30" x 18', 3/16" shell, 430 S.S.

MILLS — CRUSHERS — PULVERIZERS

2—Traylor Compeb Mills 7' x 27' with 1—500 HP & 1—600 HP motor 3/60/440.
1—Williams Hammer Mill, 300 HP.
1—A.C. 6' x 22' Tube Mill, 250 HP.
1—Smidth 6' x 20' Tube Mill, 300 HP.
1—Smidth 5'6" x 21' Tube Mill.
1—Hardinge 4½' x 24" Steel Conical Mill.
1—Denver 3' x 5' Continuous Ball Mill.
1—Telsmith Red. Crusher no. 46, 50 HP.
3—Kennedy 54" x 24" Two Roll Crushers.
2—Kennedy #6 Gyratory Crushers, 50 HP.
5—Jaw Crushers 12" x 18" to 36" x 48".
1—Penn. Non-Clog Swing Hammermill, size 5060, Hopper opening 47" x 60", cap., 200-275 tons per hour, UNUSED.
1—Penn. Super-Thor Hammermill, size SXT-13, 250 HP.
5—Raymond Bowl Mills, Two Roll, 60 HP.
3—Bradley 6' Hercules Mills, 300 HP.
3—Raymond 5 Roll Low Side Mills.

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1—18' dia. Raymond Double Whizzer Separator with 100 HP motor.
1—14' dia. Raymond Double Whizzer Separator with 60 HP motor.
2—Gayco 8' dia. mechanical Air Separators.
1—Raymond 30" dia. Whizzer Separator.
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1—Tyler Hummer Screen 4' x 10' type 38 with V-52 Vibrators and Thermionic unit.

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14—Bucket chain Elevators, 22' to 60' high.
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1—Robins 24" x 14' Belt Conveyor, 3 HP.
1—Robins 18" x 30' Troughing Conveyor.
1—Fuller-Kinyon Conveying System, type H257, 100 HP.
2—Fuller-Kinyon Conveying Systems type 10-B-No. R, 75 HP.

For Inquiries on Boilers, Diesel Generator Sets, Turbo Generator Sets, Steam Engines, write to our Department P-2

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ROCKFORD, ILLINOIS
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4—Komarek-Greaves vertical Fluxers (paddle mixers), 150 HP.
4—K-G Horiz. Fluxers 41" dia., 50 HP.
4—K-G Pug Mills, 30" dia. x 14'4".
8—Tyler Screens, 4' x 8', 4' x 6'.
2—42" wide traveling-screen cooling conveyors, total of 950'.
4—36" x 24", 24" x 18" Jeffrey hammermills, 50 HP, 25 HP.
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2—Pa. Crusher #C-3-30 hammermills.
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2—Vulcan 6' x 60' Rotary Kilns, 2 tires, ¾" shell.

2—Abbe 5' x 16' Ball Mills.

3—Bucket Elevators; 125', 32', 30'.

2—Aurora 24" Vertical Centrifugal Pumps, 200 HP motors, 500 gpm, 125' head.

1—Bemis Automatic Bag Packer, Sewing Machine, Conveyor and Flattener.

1—Byron Jackson Deep Well Pump, 75 HP Vertical Motor.

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18—Steel Buildings 20' to 80' wide, x 60' to 140' long.

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Lima 1250 3½-yd. Shovel nears end of million-and-a-quarter-yd. excavating job on highway reconstruction project near Knapp, Wis.

"LIMA 1250 moves half million yards of rock—at 270-300 yards hourly!"

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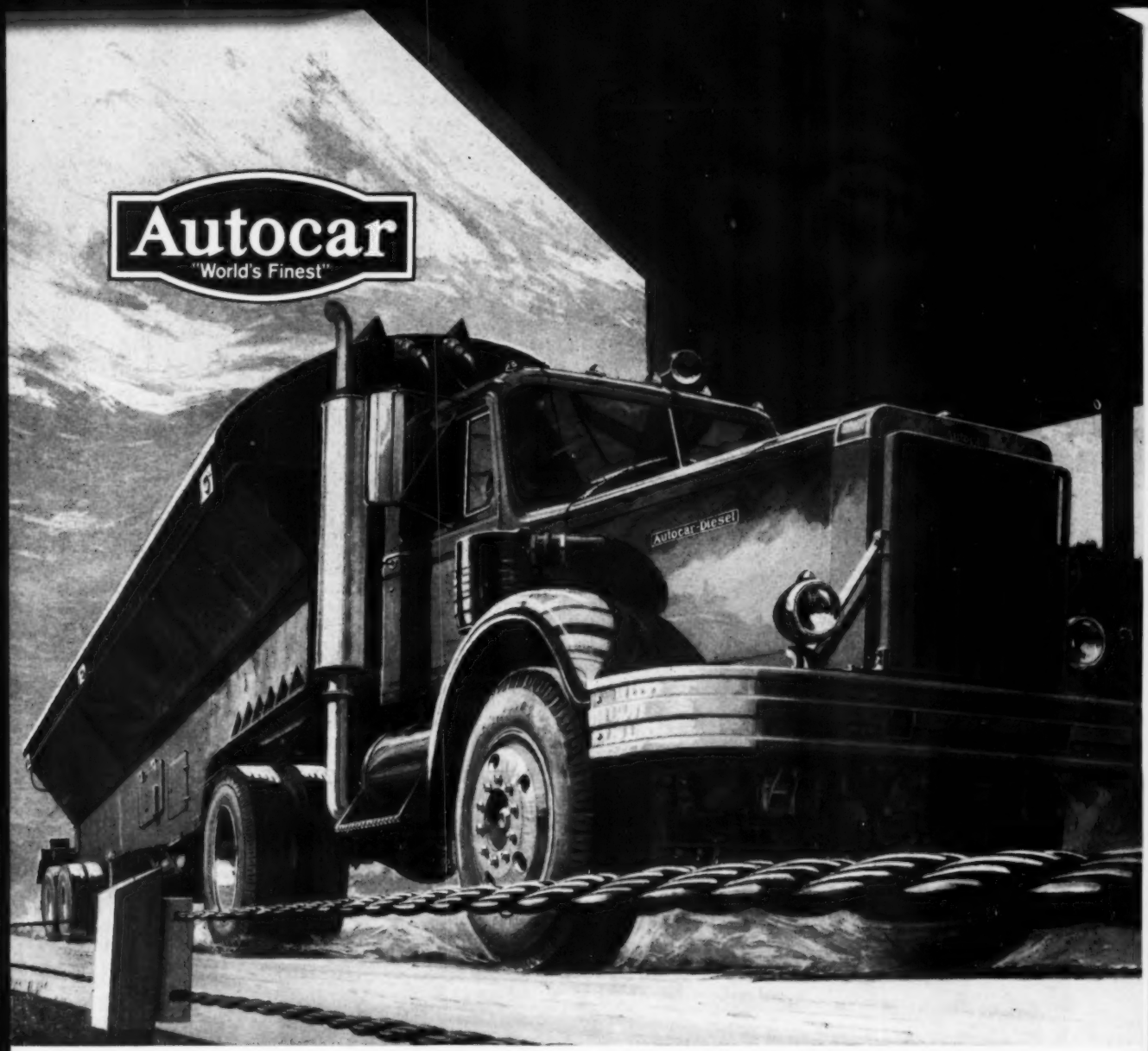

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Division of
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*See also Detailed Information in 1959 Pit and Quarry HANDBOOK and or CONCRETE INDUSTRIES YEARBOOK.

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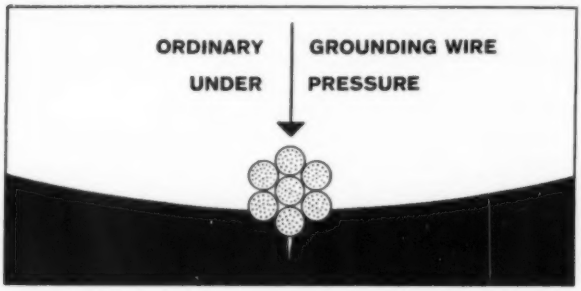
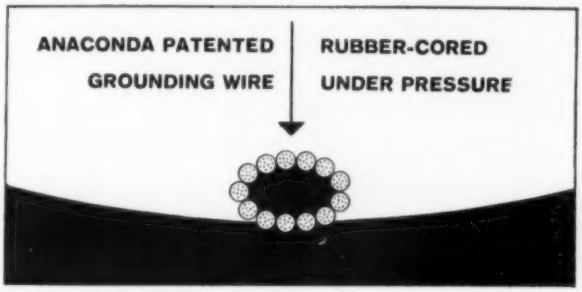
IN-USE SITUATIONS LIKE THE ONE SHOWN HERE prove why Anaconda Shovel Cable with its patented rubber-cored grounding wire outlasts ordinary cable. Under pressure, Anaconda's exclusive rubber core helps spread out the pressure—prevents internal damage. When ordinary grounding wires are subjected to the same pressure, the solid cores often cut the insulation.





Here's why Rubber-Cored Grounding Wires help Anaconda Shovel Cable last longer!

Abuse in service can seriously shorten the life of shovel cable—unless it has built-in protection, such as you find in Anaconda Shovel Cable. For grounding wire failures are one of the most common troubles. See how Anaconda engineers have solved it:

In the diagrams above you see, at left, ordinary grounding wire: a hard, compact group of stranded ropes. And at right, Anaconda patented rubber-cored grounding wire; flexible groups of stranded ropes around a soft *rubber core*.

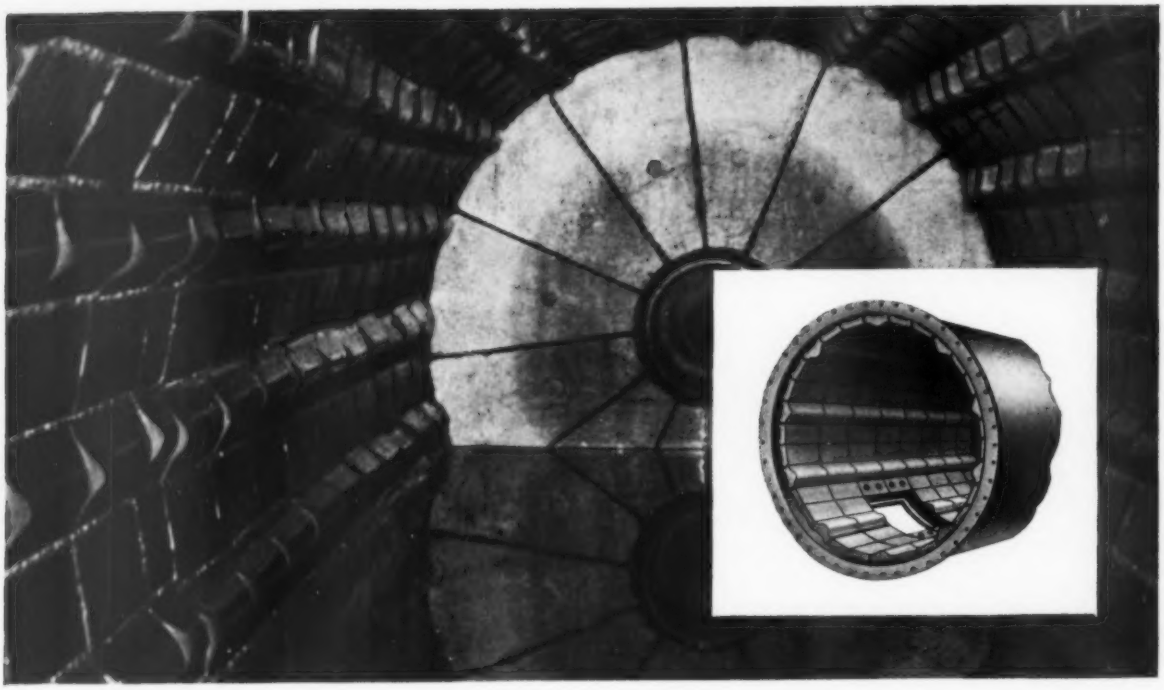
When great pressure is applied to ordinary grounding wires, the small, hard grouping of wires bites into the insulation. Result: cut and damaged insulation. *But* with Anaconda grounding wires:

- Anaconda's rubber core acts as a cushion and helps spread out the pressure—resisting damage to the insulation.
- Individual conductor strands are protected, too, to resist the kinks that so often are the cause of fatigue failure.
- Anaconda's grounding wires provide broader contact with the shielding making a more positive ground.

For longer lasting shovel cable, see your Anaconda distributor or the Man from Anaconda. Anaconda Wire & Cable Company, 25 Broadway, New York 4, N. Y. 58819

LIVE BETTER ELECTRICALLY

ASK YOUR **ANACONDA®** DISTRIBUTOR
ABOUT **SHOVEL CABLE**



8 Reasons Why You Should Standardize with B&W Universal Liner Plates

Better Performance with Lower Costs—Same Casting Fits All Mill Sizes

B&W Tube Mill Liners reduce capital, time and labor costs. Consequently, they reduce the cost of the material ground. Here are eight reasons why:

1. Lower Initial Costs—standardization eliminates chiller and pattern costs.
2. Longer Life For Liners—better quality control on a mass production casting, utilizing permanent molds, results in uniform wear. Ideal size for uniform chill and heat-treatment.
3. Longer Life for Different Applications—this is assured by selection of proper materials. Design is suitable for either chilled irons or wear steels.
4. Reduced Costs in Both Direct Labor and Outage—installation time is less because small size and weight of castings allows them to be handled easily, without cranes and with less fatigue for workers.
5. Reduces Costs in Storage Space—because small castings stack easily, little storage space is required. One design of casting interchangeable for all size mills also simplifies records.
6. Reduced Costs in Liner Inventory—standardization is possible because one design fits all diameters of mills. Standardization means quicker unloading and storage.
7. Reduced Costs on Breakage Claims and Delays for Replacements—small castings are rugged and almost impossible to break by handling. Large castings of hard, brittle irons sometimes break in shipment.
8. Reduced Costs in Determining Most Efficient Wear Patterns—you can get wear profiles consisting of all lifter ribs or all flats from the same castings, as well as a combination of both including straight or spiralled lifter pattern.

Liners are supplied in two nominal thicknesses, 1½″ and 3″ with 1½″ high lifters. Castings are 6″ wide x 12″ long. Positive seating of small castings on mill shell means less breakage of castings under operating conditions. For additional information on B&W Universal Tube Mill Liner Plates write The Babcock & Wilcox Company, Boiler Division, Barberton, Ohio.

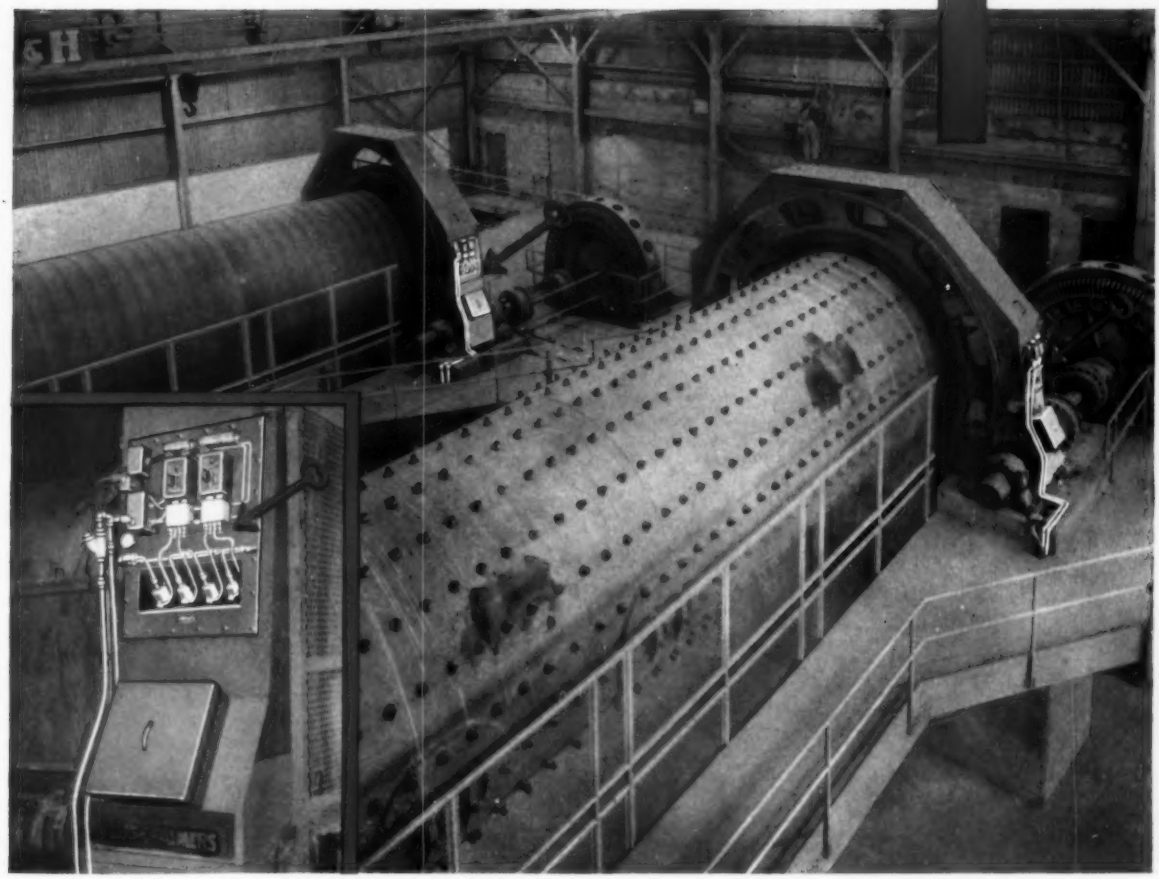
B&W THE BABCOCK & WILCOX COMPANY

BOILER DIVISION

S-471

Mill gears at new Bessemer cement plant protected by Farval spray panels

FARVAL—
Studies in Centralized Lubrication
No. 206



KEYS TO ADEQUATE LUBRICATION—
Farval spray panels on mill gears are indicated by the red key arrows above. Inset at left shows close-up of the spray panel system which can spray grease on gear and pinion at any desired time interval.

● In a cement plant today, it pays to simplify and streamline production. Demand mounts higher and higher and puts a premium on increased output.

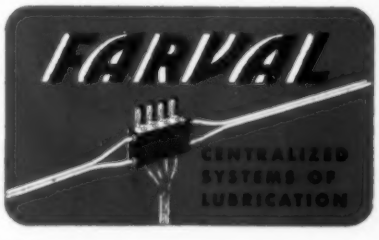
One simple, easy, inexpensive aid to faster, greater, trouble-free production is Farval. A Farval Centralized System takes the headaches and delays out of lubrication.

The Bessemer Limestone and Cement Company is another cement producer that has *Farvalized* a new plant. This photograph shows the raw mill and finish mill in the Bessemer's new plant at Bessemer, Pa., both equipped with Farval Spray Panels which automatically lubricate the mill drive gears.

There's a Farval system designed to serve your needs, too. It can save you money four ways—in reduced downtime of equipment, in bearing expense eliminated, in hand-lubricating labor and in oil or grease saved.

Ask us to mail Bulletin 26-S. And a representative will call at your convenience. The Farval Corporation, 3280 E. 80th St., Cleveland 4, O.

Affiliate of The Cleveland Worm and Gear Company, Industrial Worm Gearing. In Canada: Peacock Brothers Limited.



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